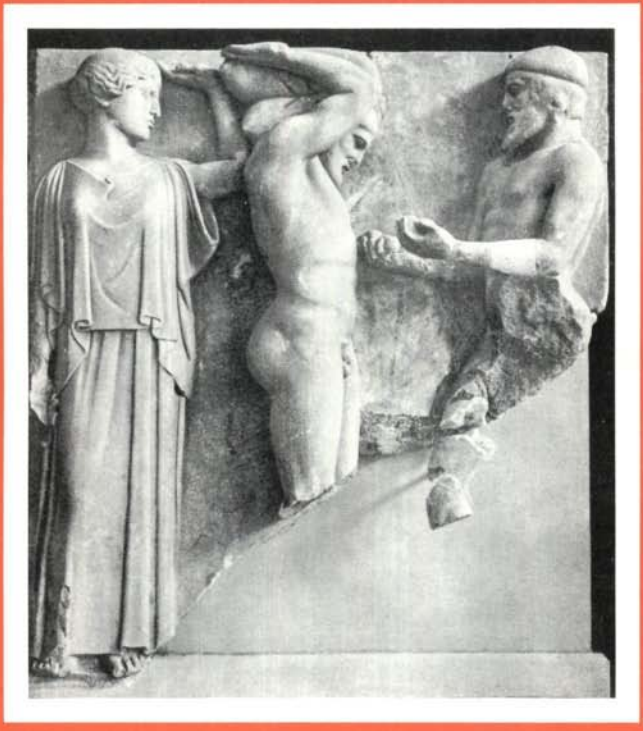
THE MANKIND QUARTERLY



VOL. XXXIV, No. 4 Summer 1994

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INTERNATIONAL INSTITUTE FOR THE STUDY OF MAN

I.U.A.E.S. INTER-CONGRESS
Florence, Italy, Spring/Summer 1995

The General Assembly of the I.U.A.E.S. decided at its Mexico meeting to hold an inter-congress in 1995 in Florence, Italy. The inter-congress will be devoted to the theme of "Biodemography and Human Evolution" and sections and subsections are being scheduled. The main sections will be:

- Impact of Early Man on Natural Environment
- Paleodemography
- Biodemography of Historical Populations
- Present situation: Proposed topics here include:

  Situation of present populations; Family structure and demographic control; Nomadic people; Artificial and natural control of demographic explosion; Population aging; Genetic structure and fertility rate in human populations; Nutrition, epidemiology, urbanization and auxology; Biotechnology and human survival; Ethnicity and regions in transition; Anthropology of urban populations; Problems of children: the global perspective; Women toward the third millennium.

Given the wide range of topics and sections a general invitation is extended to the scientific community to contribute to and participate in the '95 Inter-Congress. The organizers have proposed two sets of dates, April 19-26 or July 5-12, and a decision is expected shortly. To submit a topic for presentation or obtain other information on attendance, please contact:

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Cover Picture: Herakles assumes the burden of the vault of the Heavens from Atlas. (See article: *The Titans and the Indo-European Primal Person*.)

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Analytic Adjustment of a Function for the Sagittal Cross-Section of a Human Skull

G. Dermigny and M. E. Dehousse
University of Brussels

After a survey of the research on the average profile of the sagittal sections the Archimedes spiral has been singled out as a highly useful function, supplemented by a parabolic curve at the disconnection point. This review is followed by a examination of the measurements carried out on the sagittal and horizontal sections of skulls, compared to two other mathematical functions. Furthermore, it is tested whether one of these functions, can be used to adjust to the average curve of the dome of the sagittal sections of human skulls from the first measurement. This method appears helpful in studying fossil or living skulls and, hence, can be used to identify and track down missing persons. In addition, the confrontation of the description of the dome sections allows us to distinguish those zones which display the largest degree of variability. This appears to be the case for the front part of the skull enclosing the frontal lobe and the back part of the skull enclosing the occipital lobe.

Introduction

Accurately describing the vault of a human skull or that of a primate has always presented a number of difficulties. It is possible to set out landmarks or to study portions through drawings or X-rays. Hence the interest in finding an average reference shape, based on a number of points sufficient to make them easily located via their coordinates within a rigorously defined axial pattern.

G. Dermigny has proposed an Archimedes spiral for plotting the average line of the sagittal curve of the adult human skull. J. Compère has investigated the sagittal and horizontal cross-sections of the Cynocephalus, applying the functions proposed by M. E. Dehousse. In the present study, Dehousse applies his theory to human skulls measured by Dermigny.

The Work of G. Dermigny

Dermigny collected valuable measurements of 51 skulls of adult Europeans, of both sexes, belonging to the Laboratory of Comparative Craniology of the Lille Independent Faculty of Medicine (Pr. A. Delattre). Selecting the vesicular orientation, the skull, following treatment, lies on a horizontal plane. The vertico-frontal

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plane is perpendicular to it. Observed from the left, the skull projects at right angles on a vertical plane defined by the prevestibion, retrovestibion and acrion points (these latter to the vertex) (Figure 1).

The author demonstrates that the sagittal curve is composed of an Archimedes spiral completed by a parabolic arc (Figure 2). Defining the curve requires knowledge of the coordinates of the posterior screening point and the basion within the vestibular axes. Having selected the useful portion of the spiral, we detect the dislocation point "D" when $_D = 70°$ and $_D = 154.3$mm. His findings are that $_{Ba} = 125°$ for the *Homo* and 105° for the *Papio*.

Experience shows that many of the landmarks necessary for the application of this method are often inaccessible, but could be determined if we disposed of mathematical functions that could be identified in a small number of measurements carried out on the sagittal profile of the dome of a fossil or living skull.

The Work of J. Compère

Compère worked on a sample of 44 skulls of *Papio Cynocephalus* Kindae (both adolescent and adult) from the Katanga region. The Frankfurt plane is considered the horizontal reference plane. It is defined by the lower edge of the left-porion orbit. The median sagittal plane is perpendicular to it and passes mid-way between the porions. Each skull is fixed on a cubic craniophor and the various characteristic curves traced by means of a diagraph.

The x-axis corresponds to the nasion-opisthocranion line (Figure 3). The author also studies various horizontal cross-sections. At Compère's request, Dehousse searched for the two functions corresponding to the variational characteristics of the empiric graphs. He proposed two models referred to in "Biométrie-Praximétrie" at the request of L. Martin.

$$y = K_1 x^{\frac{d}{a}} [a-x]^{\frac{a-d}{a}} \qquad (2,1)$$

$$y = \frac{[e-c]^{\frac{d}{a}} [a-x]^{\frac{a-d}{a}} + cd^{\frac{d}{a}} [a-d]^{\frac{a-d}{a}} - eb^{\frac{d}{a}} [a-b]^{\frac{a-d}{a}}}{d^{\frac{d}{a}} a^{\frac{a-d}{a}} d^{\frac{d}{a}} a^{\frac{a-d}{a}}} \qquad (2,2)$$

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Figure 1

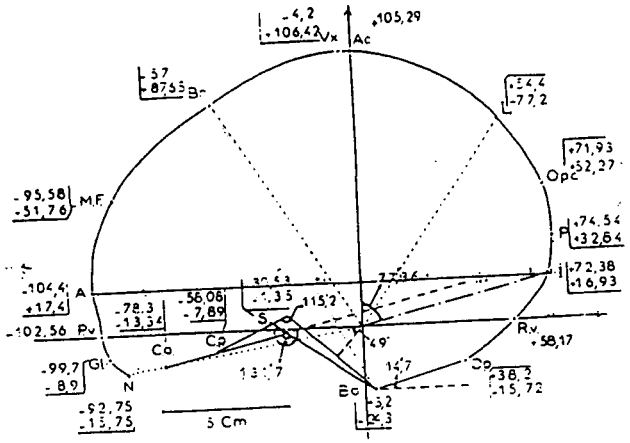

Figure 2

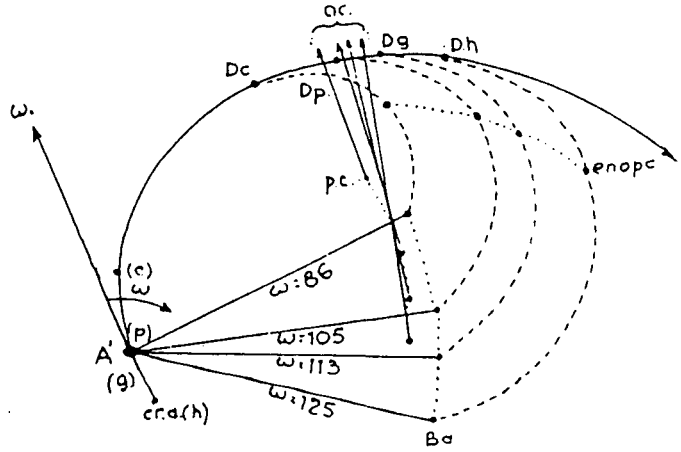

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Figure 3

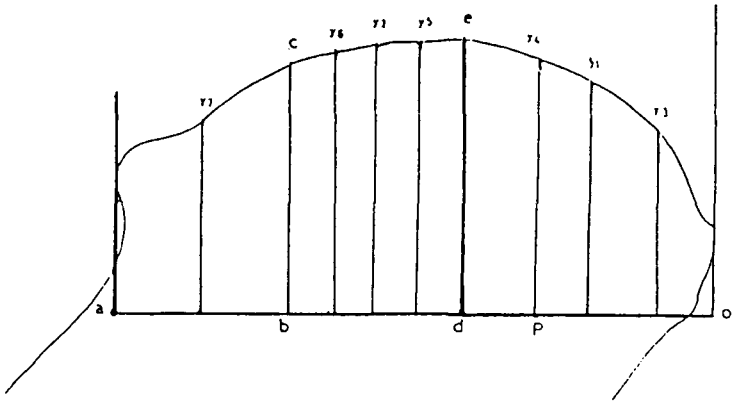
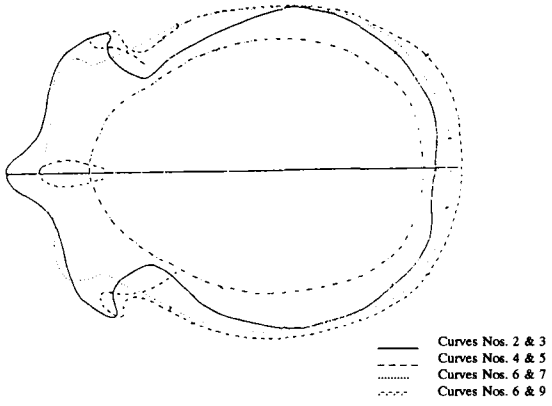


Figure 4



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in which "a" corresponds to the abscissae of the most anterior point and to the point of the vertex [d, e], in studying a sagittal profile. The point [b, c] has been determined between the vertex and one of the extreme points. It should be noted that, according to the graphs we have studied, the first function applies in any way to the curve section [d, 0] and the second one corresponds to section [a, d].

Compère applies these formulae to the sagittal and the horizontal cross-sections, concluding they can be of use in analysing the morphological characteristics of the neuro-cranium, as well as in anatomical studies undertaken for phylogenic and ontogenic purposes (Figure 4).

Study Material and Methods

We selected 43 skulls studied by Dermigny for which we had at our disposal all the data relating to the eight craniometric points which are characteristic of the vault. While these had been defined in the vestibular axes, we preferred to originate the orthonorm axes at "A", the most anterior frontal point. The x-axis is horizontal and lies within the symmetric planes of the vertical projection of the horizontal cross-sections. The y-axis is vertical and to be situated in the vertico-frontal plane. In this way, all abscissae are positive (Table 1).

We may consider that the points we have selected are characterized by a sample of 43 pairs whose coordinates follow a normal two-dimensional law. In looking for the average sagittal profile we examined the fluctuations of the abscissae and ordinates of the landmarks calculated with their standard sampling variations.

A≡ 0 (0,0)	
Medio-frontal	M_F (10,0± 4,7 ; 34,8 ± 14,5)
Bregma	B_r(47,8± 8,2 ; 70,3 ± 11,8)
Vertex	V_x(100,5± 6,1 ; 88,7 ± 10,7)
Acrion	A_c(104,8± 6,9 ; 88,0 ± 11,0)
Lambda	L_d(159,2± 9,5 ; 59,6 ± 10,3)
Opisthocranion	O_{pc}(175,9± 8,4 ; 35,2 ± 11,6)
Most posterior pt.	P(179,6± 6,7 ; 16,1 ± 10,8)

The confidence intervals of 99%, within which the average positions of the landmarks are to be located, show larger dispersions in the ordinates in the front of the skull at the level of the opisthocranion. The confidence rectangles are elongated and parallel to "Dy" (Table 2). Five landmarks out of eight appear fairly stable and lead us to

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Table n° 1

Nos	M.F.	Br	Vx	Ac	L	Opc	P
1	15	53	71	70	47,5	22	-6
2	32	65,5	80	79	49	39	15
3	24	66	91	91	64	31	21
4	56	81	97	97	69,5	29	16
5	40	75,5	95	95	77,5	42	31
6	30	72,5	85	83	45,5	48	-5
7	30	64	80	80	56,5	27	12
8	57	89,5	105	105	70	36	29
9	29	66	79	78	39,5	28	3
10	31	65	85	84	58,5	39	10
11	25	62,5	70	79	43,5	16	6
12	23	63,5	88	87	54	37	12
13	16	56,5	83	81	72	53	11
14	60	96	112	112	73	68	43
15	22	57	80	79	53	36	20
16	10	60	89	88	65	36	27
17	35	74,5	91	90	58	36	12
18	24	64	86	86	53,5	39	11
19	28	56	71	70	48	22	6
20	57	87	100	99	68,5	30	25
21	25	63,5	85	82	60	18	16
22	19	64	80	83	55	30	12
23	29	67	94	93	72	28	27
24	30	66	80	78	42,5	13	4
25	54	88	100	100	69	61	35
26	20	57,5	77	76	64	39	13
27	30	64,5	82	81	55	34	9
28	31	68,5	84	83	53	29	-2
29	25	61,5	82	81	59	45	18
30	62	93	104	103	71	40	27
31	28	64	83	83	49	29	19
32	59	91,5	113	114	81	51	41
33	38	64	76	76	49	24	9
34	27	60	79	79	57	32	12
35	57	87	102	102	63	39	16
36	28	68	100	100	69,5	59	20
37	57	87	101	100	65,5	39	14
38	55	89	105	104	70	25	22
39	21	60	85	83	69	46	21
40	41	69	88	88	55,5	32	24
41	31	66,5	83	79	52	31	20
42	54	84	101	100	67	28	11
43	32	64,5	82	81	47	29	7

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Table n° 2

Empirical Data	**Average standard error**	**Average confidence interval for / = 0.99 at risk coefficient at the extremes $K_1 = K_2 = 0.005$**	**Theoretical values of the ordinates Functions (2.1) and (2.2)**
Most anterior point in identification with origin of axes A (0.0)		$Y_O = O$	0 (2.1)
Medio-frontal M_F (10 ; 34.8)	$s_{\bar{Y}_{MF}} = 2.24$	$29 < \bar{Y}_{MF} < 40.6$	$Y_{MF} = 34.3$
Bregma Br (47.8 ; 70.3)	$s_{\bar{Y}_{Br}} = 1.82$	$65.6 < \bar{Y}_{Br} < 75$	$Y_{Br} = 73.3$
Vertex V (100.5 ; 88.7)	$s_{\bar{Y}_{Vx}} = 1.65$	$84.4 < \bar{Y}_{Vx} < 93$	$Y_{Vx} = 88.7$
Acrion Ac (104.8 ; 8.88)	$s_{\bar{Y}_{Ac}} = 1.69$	$83.6 < \bar{Y}_{Ac} < 92.3$	$Y_{Ac} = 88.6$
Lambda L (159.2 ; 59.56)	$s_{\bar{Y}_{L}} = 1.59$	$55.5 < \bar{Y}_{L} < 63.7$	$Y_{L} = 63.2$
Opisthocranion O_{pc} (175.9 ; 35.23)	$s_{\bar{Y}_{Opc}} = 1.79$	$30.6 < \bar{Y}_{Opc} < 39.8$	$Y_{Opc} = 35.23$ (2.2)
Most posterior P P (179.6 ; 16.14)	$s_{\bar{Y}_{P}} = 1.67$	$11.8 < \bar{Y}_{P} < 20.44$	$Y_{P} = 16.14$

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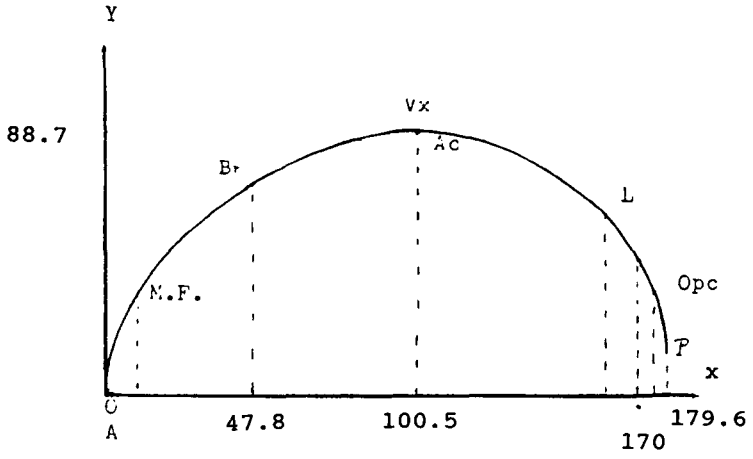
Figure 5



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attempt an analytic adjustment with a view to characterizing the average profile of the vault.

Adjustment of the Function to the Average Curve of the Median Sagittal Cross-Section

The function (2,1) proves to adequate to give satisfactorily calculated ordinates up to the proximity of the opisthocranion. Within the polar axes defined previously, this corresponds to a transition point for which W = 1.64 rad, i.e. 94°. The most posterior mid-point "P" used to mark the limit of the selected arc is found on the orientation vector radius W = 100°, i.e., with a minimum difference of 3.7mm between the abscissae. The definition interval of the average sagittal arc, examined during the study, has a total width of 179.6mm.

The proposed theoretical curve (4,1) and the empirical average curve pass through the most anterior point "A" and are tangential to "Oy". They pass through the same maximum at the vertex, where the tangent is horizontal.

$$y = 0.98071\, x^{0.5596}\, (179.6 - x)^{0.44038} \quad 0/x/x_{O_{pc}} \qquad (4,1)$$

The short parabolic branch (4,2) passes through the opisthocranion and has the top at "P".

$$y = 9.92442\, (179.6 - x)^{0.5} + 16.14 \quad x_D/x/x_p \qquad (4,2)$$

The coordinates of the theoretical transition point "D" are (170,47). We measured the ordinates of the 22 points selected on the original average curve and found them on both sides of the vertex (Table 2). In this way, we obtain the theoretical profile of the average sagittal curve (Figure 5).

Quality of the Adjustment

The eight landmarks on the outside of the skull play a determining role in calculating the empirical and theoretical means of the ordinates, as well as the reduced variances covering 95% of all cases. The theoretical "t" at 1% probability level is of 3.499. As the calculated "t" is found at 1.53, we can conclude that the difference between the two means is not significant. We assume that the 22 paired ordinates of the points selected on the sagittal profile are samples taken from total populations with equal means and variances (Table 3). We thus obtain an estimation of the correlation between the two variabilities of the 22 pairs of empirical and theoretical

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Table n° 3

A = O		Y empiric O	Y theoric O
M_F	10.09	34.81	34.3
	20	48	49
	30	58	58.7
	40	66	68
B_r	47.84	70.3	73.3
	60	77	79.7
	70	83	83.6
	80	85	86.4
	90	87	88.1
V_x	100.51	88.7	88.7
A_c	104.79	87.95	88.6
	120	86	86.5
	130	82	83.4
	140	77	78.7
	150	71	72
L	159.21	59.56	63.2
D	170	45	47
O_{pc}	175.91	35.23	35.23
	177	31	32.1
	178	28.5	28.7
P	179.6	16.14	16.14

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ordinates by comparing the empirical and theoretical variances for small samples.

$$F_{calc} = 1.03F_{th} = 2.9$$

The difference between these two values is not significant at a 2% probability level.

$$n = 22$$

Means :

$$\bar{Y}_{emp} = 59.87 \qquad \bar{Y}_{th} = 61.02$$

Type error of the means :

$$s_{\bar{Y}_{emp}} = 5.73 \quad s_{\bar{Y}_{th}} = 5.81$$

Type error of the difference through means:

$$s_{\bar{DY}} = 7.97$$

The calculated "t" ratio is 0.144, while the theoretical "t" is established at 2.7.

Based on the hypothesis as shown above, the difference in the means is not significant at the level of 1% probability. The general standard variation enables us to assess the dispersion around the adjusted values of Y and X. This provides an indirect estimate of the difference in the ordinates of the points which generate empirical sagittal profiles and the adjusted curve.

$$s_{Y.X} = 1.63$$

Given its relatively low level, this cannot be an erratic correlation. The curvilinear correlation ratio calculated from the 22 paired data confirm the quality of the adjustment :

$$r_{Y_{emp} \quad Y_{th}} = 0.9$$

controlled for 18 points by (4,1) and for 5 points by (4,2).
The proposed method of adjustment appears statistically well-founded.

Discussion and Conclusion

The study highlights the effectiveness of the function (2,1) in defining the greater part of the sagittal profile of the human cranial vault. The parieto-occipital region is adjustment-sensitive in both men and baboons. In the front of the skull it is in the medio-frontal landmark that we find the greatest dispersion. A high vertex is frequently accompanied by a high medio-frontal landmark.

Six cases of 43 do not follow the rule. The diversity of the adult skulls from the same region and the fact they are of both sexes

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prevent us from drawing further conclusions on the basis of the sample used.

The proposed functions can be of use in research in morphological characteristics, both of differentiation between adults and of modifications during their growth. Once the skulls have been correctly oriented, three landmarks play a determinant role and their average coordinates are sufficient for producing the adjusted graph. They are the most anterior point, the vertex, and the most posterior point.

It would be interesting to undertake a systematic study of adult skulls from various regions (Caucasian, Ethiopian, Mongol, Oceanian, for example) in order to reveal the profile of the average sagittal vault of the present-day populations of these regions, establishing such a graph on the basis of the proposed functions. The progressive transformation of the theoretical median sagittal profile of a skull during growth, monitored by periodic measurements of the coordinates of the landmarks, would enable us to identify those portions of the arc which are particularly sensitive at predefined ages. The chosen parameters could be expressed as a function of time.

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How Important is the Role of Intelligence in the Rise of Civilization?

Maria T. Phelps
University of Western Ontario

Lynn (1991b) contends that racial differences in intelligence test scores are also reflected in the rise of civilization. During the Neolithic period, only Mongoloids and Caucasoids exhibited all the defining characteristics of civilization such as agriculture, writing and number systems. In contrast to Negroid populations, Mongoloid and Caucasoid populations were exposed to the extreme cold of the main Würm glaciation, resulting in a process of selection in favor of higher intelligence in the populations occupying the Eurasiatic land mass. Lynn (1991ab) suggests that this increase in intelligence was the causative agent responsible for the rise of civilization. The author argues, however, that although intelligence might be a necessary condition for the rise of civilization, it is not by itself a sufficient reason. She argues, that agriculture, a necessary precursor of civilization, developed when hunting and gathering were no longer ecologically viable. The technological and social innovations that followed were the result of a multiple causative network and cannot be attributed solely to increased intelligence. Finally, the problems of conceptualizing civilization as an event instead of a process are discussed.

An analysis of global intelligence test scores conducted by Lynn (1991b) revealed that Mongoloids living in North America and Asia obtain higher mean IQ scores (101-108) than North American or European Caucasoids (100), and Caucasoids obtain higher mean IQ scores than American-Negroid (85) or African-Negroid (70) populations. Because intelligence is highly heritable (e.g., Bouchard, Lykken, McGee, Segal & Tellegen, 1990), Lynn (1991ab) argued that these differences in intelligence are genetically based. Rushton (1988) has expanded the list of heritable factors that serve to differentiate the three races to include physiological, reproductive and personality variables. Further, a number of studies examining the relationship between reaction time and intelligence also indicate a similar ordering of the three races, with Mongoloids exhibiting faster reaction times than Caucasoids and Negroids, respectively.

This latter finding is particularly noteworthy in two respects. One, reaction time is a measure that is unaffected by experience. Two, other studies, not concerned with the ranking of the races by intelligence, have demonstrated that reaction time is positively

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associated with intelligence (Vernon, 1993). The universality of racial differences in IQ test scores and reaction time measures supports Lynn's (1991ab) claim that the explanation for these differences cannot be solely accounted for by environmental factors such as social and economic conditions.

Lynn (1991b) then makes the claim that racial differences in intelligence are reflected both in the level and complexity of civilization attained by the three races. He reasons that if scientific, intellectual and technological innovations are made by a few highly intelligent individuals then there will be more of these in a population where average intelligence is high. Consequently, Lynn argues (1991a) that Mongoloid and to a lesser extent Caucasoid populations, in contrast to Negroid populations, exhibited all the defining characteristics of civilization such as agriculture, mathematics, legal, ethical and religious systems. According to Lynn (1991ab) the level of intelligence necessary to create civilization, however, was not to be attained until the Neolithic period, approximately 9,000 years ago. The problems of survival during periods of extreme cold caused by the main Würm glaciation (24,000-10,000 years ago) was the selective force that produced further increases in intelligence in Caucasoid and Mongoloid populations and this increase in intelligence laid the foundation upon which civilization is built (Lynn, 1991ab). Because Negroid population were not exposed to the main Würm glaciation, they did not undergo a transformation in intelligence that was a necessary precondition for the rise of civilization (Lynn, 1991ab).

It is only the latter point, that civilization is an intellectual achievement, that this author takes issue with. Most anthropologists feel that agriculture is the necessary first step toward urbanization and complex social and political systems that characterize civilization (Childe, 1967; Fiedel, 1992; Flannery, 1969; Hardesty, 1977; Henry, 1989; Layton, Foley & Williams, 1991; Redding, 1988; McCorriston & Hole, 1991; Perkins & Daly, 1974; Stigler, 1974). The adoption of agriculture as a subsistence mode occurred because hunting and gathering were no longer ecologically or economically feasible (Fiedel, 1992; Henry, 1988; Layton *et al.*, 1991; Redding, 1988; McCorriston & Hole, 1991; Perkins & Daly, 1974). The explosion of cultural innovations that followed, for example, writing, number systems, standardization of measurement, and astronomy, were attempts to adapt to the changes brought about by the new agricultural economy by creating new tools (Childe, 1967; Fiedel,

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1992; Flannery, 1969; Hardesty, 1977; Henry, 1989; Redding, 1988; Perkins & Daly, 1974; Stigler, 1974). It will be argued that the technological, organizational and ideological changes associated with the rise of civilization are the products of a multiple causative network and can not be attributed to a single causative agent, such as intelligence.

Agriculture: The Best of a Bad Job Strategy

Lynn (1991a) postulates that his theory solves a problem that has long perplexed anthropologists, namely why didn't civilization and its precursor, agriculture, occur prior to the Neolithic revolution? Lynn (1991a) suggests that the reason is because prior to 10,000 years ago *Homo sapiens* had not attained a level of intelligence high enough to invent civilization. I argue that the reason why agriculture and civilization did not occur between 200,000-10,000 years ago is more likely due to the fact that the precultigens (i.e., ancestral populations of the major cereal grains, maize etc.) were absent because of the prevailing climatic conditions of the Pleistocene (Fiedel, 1992; Henry, 1989; Layton *et al.*, 1991). To put it more simply, it is difficult to have agriculture as a subsistence mode when the plant resource base has not come into existence. The precultigens were selected by the early farmers because their short reproductive cycles and self-fertilization were easily manipulated, thus making them ideal candidates for domestication (McCorriston & Hole, 1991).

What has perplexed anthropologists, however, are two anomalies in the archaeological record of early farming communities in both the New and Old World. One, the archaeological record of early farming communities show that agriculture did not arise in lush environments but rather in marginal, arid semi-desertic ecological zones (Fiedel, 1992; Henry, 1989). The second anomaly concerns the apparent ill-health of the early farming populations, relative to both ancient and modern hunter-gatherers (Fiedel, 1992; Henry, 1989; Layton *et al.*, 1991). For example, skeletal remains of early farmers exhibit numerous instances of nutritionally based and infectious diseases. The question that anthropologists ask is why did humans abandon the previously successful subsistence mode of hunting and gathering and switch to agriculture? One answer is that these early farmers had no choice. The changes in the prevailing climatic and environmental conditions in combination with increasing population size forced these people to abandon hunting and gathering and adopt an alternative

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subsistence mode, agriculture, in order to survive (Fiedel, 1991; Henry, 1989; Layton *et al.*, 1991; McCorriston & Hole, 1991; Redding, 1989). Further, the mass extinction of the megafauna due to increasing aridity of the climate also necessitated the broadening of the resource base to include the harvesting of vegetal material.

In order to maximize their rate of return from the new resource base, nomadic hunters and gatherers became sedentary, devoting more time and energy to the efficient cultivation and harvesting of the cultigens. One of the peculiar side effects to adopting a sedentary lifestyle is the consequences it has on female fertility and fecundity. Because fertility in females is dependent upon the body fat to body weight ratio, decreasing the time spent in the search for and pursuit of mobile food items acts to increase females' reproductive output (Henry, 1989). In addition the switch from a high-protein, meat-based diet to a high carbohydrate, low-protein, cereal-based diet also contributed to higher body fat to body weight ratios (Henry, 1989). Once a group becomes sedentary and adopts a plant-based diet, it sets into motion a vicious cycle of increased offspring production, which in turn requires increased food production, forcing groups to develop more effective means of resource extraction. In other words, necessity is the mother of invention. It is at this point in human history that intelligent individuals can make a difference by ensuring group survival through technological or intellectual innovation. In the absence of these ecological pressures, however, I argue that there is no need to invent more effective farm tools when survival is largely dependent on a mobile meat-based resource.

Agriculture and Civilization

Agriculture propelled population growth, and as a function of a positive feedback loop, the increased population size could only be supported by the adoption of more intensive farming methods, such as irrigation, and terracing (Fiedel, 1992; Perkins & Daly, 1974; Stigler, 1974). Coincidentally, intensive agricultural practices also produced a resource surplus that enabled farmers to remain sedentary during periods of resource fluctuations (Fiedel, 1992; Henry, 1989). In contrast, hunters and gatherers typically respond to scarcity by dispersing and migrating in search of new food sources (Fiedel, 1992). In addition, the increase in intensity of land use activated the processes culminating in complex social and political institutions such as the state (Fiedel, 1992; Flannery, 1969; Hardesty, 1977; Henry,

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1989; Perkins & Daly, 1974; Stigler, 1974). As land was used more intensely, there was not only an increasingly large gap between the most valuable land and the least valuable land but also a progressively smaller amount of valuable land (Fiedel, 1992; Flannery, 1969; Hardesty, 1977). For example, nearly 35% of the total land of western Iran is optimal for the hunting of ungulates (Flannery, 1969; Hardesty, 1977). However, the shift to dry farming decreased the percentage of optimal land to 10% and the shift to irrigation farming to only 1% (Flannery, 1969; Hardesty, 1977). Consequently, specialized social groups evolved for the purpose of holding and maintaining these scarce resources (Fiedel, 1992; Flannery, 1969; Hardesty, 1977; Perkins & Daly, 1974; Stigler, 1974). These specialized social groups led to new patterns of political and religious authority, class stratification, the appearance of new economic classes not directly engaged in producing their own food, and mechanisms for apportioning wealth (Fiedel, 1992; Stigler, 1974). Agricultural surpluses made this possible by feeding construction workers, religious authorities and town-dwellers (Fiedel, 1992; Perkins & Daly, 1974; Stigler, 1974). Thus, agriculture is the foundation upon which civilization is built. Agriculture necessitated social and political change that evolved to manage the scarce resource of arable land and also provided the surplus to feed those not directly involved in resource extraction. If human groups had not been forced to adopt this new subsistence mode, the infrastructure necessary to attain and sustain large groups of even highly intelligent people would be absent.

The Tools of Civilization

Contrary to popular opinion, most hunting and gathering societies possess religious, ethical and legal systems in which certain behaviors are either proscribed or prescribed by the group (Fiedel, 1992; Greenwood & Stini, 1977). What hunters and gatherers do not evidence are the stereotypical tools of civilization, writing, mathematics and astronomy, that most anthropologists typically associate with civilization. The issue that I wish to address is why these traits co-occur with urbanization and agriculture. I argue that the differing demands of civilization compared to hunting and gathering necessitated the development of these new tools. That is, the appearance of these additions to the human tool kit at this point in human history can not entirely be accounted for by an increase in the level of intelligence.

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One of the most complete examples of the evolutionary history of writing is provided by the Sumerians of southern Mesopotamia. In the civic and religious buildings of these ancient peoples, the earliest clay tablets are found that record the evolution of pictographic form writing into an ideographic-cum-phonetic system, the standard cuneiform of later Mesopotamia (Stigler, 1974). The functional *raison d'ê tre* of the writing system is readily apparent in these fossils. They are account ledgers, records of livestock and harvest yields, receipts, expenditures and wage lists (Childes, 1967; Stigler, 1974). In other words, these clay tablets document the administration of an agricultural surplus that supports specialists who do not produce food directly but rather build temples, pottery and agricultural terraces (Childes, 1967: Stigler, 1974).

The economy of mobile hunters and gatherers dictates a different pattern of adaptation because for this lifestyle the costs associated with maintaining a resource surplus can exceed the benefits (Layton *et al.*, 1991; McCorriston & Hole, 1991; Redding, 1988). When the energetic and nutritive demands of each individual in the group are met, as is characteristic of hunter-gatherers, time and energy spent in the maintenance and defense of a resource surplus is unnecessary (Fiedel, 1992; Henry, 1989). Further, the mobility required by the hunter-gatherer resource base also prevents the maintenance and defense of the surplus from other groups (Layton *et al.*, 1991). The assignment of individuals to activities not directly involved in food production would detract from the rate of energetic gain for the entire group (Layton *et al.*, 1991). And, in the absence of a surplus, there is no need to document its use by those not directly involved in resource extraction.

A number system would be as necessary a tool as a writing system in order to adapt to the new economy. For hunters and gatherers, notches on a tally stick for each bison slain by a hunter would suffice (Childe, 1967; Fiedel, 1992; Stigler, 1974). For enumerating the vast herds of a religious temple or the contents of a city granary, however, such a system would be inadequate (Childe, 1967). The new economic conditions also required the creation of arithmetic and geometry in order to ascertain and predict the number of bricks to be used for the building of a new temple wall or the number of men needed to build a new terracing system (Childe, 1967; Fiedel, 1992; Stigler, 1974). Thus, the genesis for this new tool is evident in its function. It was not created to satisfy an interest in the properties of

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numbers as such, or in the measurement of an abstract empty space (Childe, 1967).

Similarly, astronomy was developed in order to foretell the precise time to begin agricultural operations (Childe, 1967: Fiedel, 1992; Stigler, 1974). It is not an accident that many temple structures are aligned with some star or constellation that facilitates the determination of the precise time of the spring and autumnal equinox (Childe, 1967: Fiedel, 1992). Ascertaining the length of the growing season is an important consideration for farmers because it aids in the decision of when to plant and when to harvest. A sudden frost can spell disaster for a group dependent on a plant-based resource (Layton *et al.*, 1991). For hunter gatherers dependent on a mobile meat-based resource, a sudden change in weather is handled by dispersing early or later in the year (Fiedel, 1992). This, however, is not an option for a group of sedentary farmers who provide for their own needs as well as the needs of non-food providers.

The standardization of measurement also arose in response to the demands created by the new subsistence mode (Childe, 1967; Fiedel, 1992; Stigler, 1974). In order to construct a hand-axe the needs of a hunter and gatherer are supplied by nature – the length of a finger, or forearm would suffice (Childe, 1967). In contrast, the construction of a large temple or terracing system would be seriously hampered by the use of such measurement because not every arm is of the same length. To put it more simply, such an inaccuracy could result in some beams failing to span the temple while others would project beyond its walls (Childe, 1967).

Thus, the addition of new tools to the human tool kit occurred because of the new demands created by agriculture. What intelligence did was to ensure that these new demands or challenges were met successfully. For hunter-gatherers the use of these new tools would not be necessary and in some case would be cost-prohibitive. In other words, the intellectual capability to invent these new tools existed in Caucasoid and Mongoloid hunter-gatherer populations but it did not manifest itself in the form of writing and numerical systems until it was needed. The impetus for each new innovation and the innovations themselves are parts of an interlocking system that can not be explained by an appeal to a single causative agent, such as intelligence.

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The Concept of Civilization as an Event

There may also be problems with Lynn's (1991ab) conceptualization of civilization as an event instead of a process. Obviously, there was not a time when a group of Mongoloid or Caucasoid hunter-gatherers, huddled around the camp fire, spontaneously decided to invent civilization; yet, this scenario is implied in Lynn's analysis. Rather than following a unilineal developmental sequence, the economic and social changes in the Old and New World are best understood in the context of consequences of an interaction of population growth and climatic environmental changes that were the catalysts for civilization (Fiedel, 1992; Henry, 1989; Layton *et al.*, 1991; McCorriston & Hole, 1991; Redding, 1989). An ecological approach to understanding the evolution of civilization is more compatible with the evidence than an event-based hypothesis. Anthropologists long ago abandoned the view of civilization as the end product of a unilinear trend due to the existence of a phenomenon known as reversion. Reversion occurs when a previously agricultural or urban group reverts back to a hunting and gathering lifestyle because of the collapse of the agricultural infrastructure due to variety of reasons, such as over cultivation or decreasing rainfall. Contrary to an event-based model of human cultural evolution, human groups may return to a 'primitive' hunting and gathering subsistence mode due to changes in ecological conditions rather than a drop in intelligence. This illustrates the danger of perceiving the transition between hunting and gathering as a one-way process that in some sense constitutes a step up the evolutionary ladder.

As stated previously, the catalysts for civilization include the pressure of population growth and the scarcity of basic resources produced by the adoption of agriculture as a subsistence mode (McCorriston & Hole, 1991; Redding, 1989). In such circumstances, societies had to reorganize in order to survive. The shift to a centrally organized, stratified society may not have been the only possible solution, but it is one that has occurred independently in many parts of the world. In that sense environmental and population stress may be conceived as an event. But, the occurrence of that event is heavily predicated on the occurrence of a population and environmental stress interaction. If these two factors do not co-occur, I argue that there is no reason to adopt an alternative lifestyle.

Finally the conceptualization of civilization as an event is a

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double-edged sword that can also be used to impale Lynn's (1991ab) argument. In contrast to the pattern observed in Europe, the archaeological record in China shows a 3,000 year interval between the development of agriculture and the rise of civilization. For over two centuries, Japan failed to capitalize on superior military technology (guns) despite their introduction by Westerners in the 1700's. From an event-based perspective, these examples could be interpreted as evidence disputing north east Asians as intellectually superior to Caucasoids. By viewing civilization as an alternative subsistence mode or process, however, I suggest that Mongoloid hunter-gatherers would still obtain higher IQ scores than urban Caucasoid and Negroid populations. Based on Lynn's (1991ab) global survey of IQ scores and reaction time measures, such an argument is not incompatible with the evidence.

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Optimal Adjustment of Mating Effort to Environmental Conditions: A Critique of Chisholm's Application of Life History Theory with Comments on Race Differences in Male Paternal Investment Strategies

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In a recent article, Chisholm drew attention to the possibility of applying life history theory to humans. He argued that humans could have a built-in mechanism which detects parental stress (indicating high mortality conditions) and responds by increasing mating effort at the expense of parenting effort. However, the production of more offspring in adverse times would force parents to divide scarcer resources among more children, thereby lowering reproductive success. The evolutionary facts are better explained by simple genetic mechanisms. The optimal strategy in the plentiful environments such as most tropical zones would differ from that appropriate to colder climates. Males in the tropics would be selected for high mating efforts, while males in harsher northern climates would be selected for strong pair bonding that would enhance the likelihood that their offspring will survive to reach maturity and reproduce in their turn. Certain racial differences can be explained by this theory of evolutionary adaptation.

In recent articles, Chisholm (1993) and Belsky, Steinberg and Draper (1991) have tried to apply life history theory to humans, arguing that humans could have a built-in mechanism which detects parental stress (indicating periods of high mortality) and responds by increasing mating effort at the expense of parenting effort. While the theory appears to have originated with Belsky, Steinberg and Draper (who build on Draper and Harpending, 1980, 1982), the Chisholm exposition is the more recent. This paper will first critique the Chisholm paper, and then discuss an alternative mechanism that could explain the observed differences between human populations.

Chisholm attempts to explain the evidence that in contemporary Western societies there is a correlation between stress-causing problems in the family a child grows up in (such as absence of a

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father) and certain behaviors in the children, including higher illegitimacy rates. In general, Chisholm observes that individuals seem to vary along a mating effort versus parenting effort continuum, with the position correlated with the environment in which the child was raised. Mothers whose behaviors lean to early sexual activity, illegitimacy, or divorce tend to produce children who in turn engage in the same behaviors.

Chisholm's theory hypothesizes that the experience of stress by children in the environment of evolutionary adaptation is a sign that mortality during adulthood is high, causing a shift away from a high paternal investment strategy. The basic model comes from Belsky *et al* (1991) and is shown in Chisholm's Figure 2. In one type of family (Chisholm's Type I family) there is much stress, marital discord, and inadequate income (i.e. control over material resources). This causes the parents to adopt a harsh, rejecting, insensitive, inconsistent child-rearing style. Children develop an insecure attachment to their mothers, a mistrustful internal working model, and an opportunistic interpersonal orientation. Males become aggressive and non-compliant, and females become anxious and depressed. The effect on somatic development is early maturation and early puberty. The reproductive strategy adopted consists of early sexual activity, shorter term, unstable pair bonds, and limited parental investment.

In contrast is Chisholm's Type II family, characterized by spousal harmony and adequate material resources. This facilitates child-rearing which is more sensitive, supportive, responsive and positively affectionate. The resulting psychological and behavioral development involves secure attachment, a trusting internal working model, and reciprocally rewarding interpersonal orientation. The effects on somatic development include later maturation and puberty. The reproductive strategy adapted involves later sexual activity, long-term, enduring pair bonds, and greater parental investment.

The evidence Chisholm offers for this pattern comes both from the sociological literature comparing different individuals within contemporary Western societies and from anthropological literature which indicates that whole societies lean towards one or the other pattern of procreation and child-rearing behavior (Draper 1989).

Ignoring the possibility of a genetic determinism mechanism, Chisholm proposed a mechanism by which humans had evolved to pick up signals from their childhood environments which influenced

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the reproductive strategies they would adopt as adults. Such an adaptive mechanism in humans is certainly possible. Many organisms undergo a "development conversion" (Lively 1986), whereby the environment encountered when young influences the later development of the organism.

However, that such a mechanism is possible does not show that it is probable. For such a mechanism to have evolved it would have to increase survival-fitness. Chisholm apparently believes that the best way for a gene to survive periods of high mortality is for the gene's carriers to have more children. He suggests (pp. 4-5) that when mortality rates are high, increasing mating effort "will work best." Yet for females, on which his discussion focuses, this seems unlikely. It is a basic tenant of sociobiology that females are seldom limited in their reproduction by access to mates. But energy devoted to mating with a variety of males may tend to reduce their chances of finding a mate who will assist them in providing sustenance for their offspring.

For males, it is probably possible to increase the number of offspring by more mating effort, but this is likely to be at the expense of parenting effort. Surely a bet-hedging emphasis on staying in the game during *adverse* times (as Chisholm suggests) would call for males to substitute parental investment for mating effort. This would increase the probability that at least some of their offspring would survive the adverse period. In good times, when food is readily available, a female may be able to raise her offspring without male assistance. In such conditions the male maximizes reproductive fitness by diverting effort from provisioning to seeking a multitude of matings. Conversely, in harsh times, food is scarce and a female may not be able to rear her offspring without his assistance in provisioning them. Thus, in harsh environments, mating effort should be decreased and parental investment increased. This is opposite to what Chisholm argues.

Surprisingly, none of the *Current Anthropology* commentators referenced Maccoby's (1991) comment on the Belsky, Steinberg and Draper (1991) piece that Chisholm relied on so heavily. Maccoby argued that adopting a quantity strategy was not a sensible female reaction to hardship and instability, for reasons similar to those being argued here.

Chisholm makes the correct (and important) point that long-run

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reproductive success depends on limiting variance as well as on the average number of descendants per generation. However, his Figure 1 refers to intergenerational variance in fertility when the logic of the bet-hedging argument implies it should refer to intergenerational variance in reproductive success (defined as the number of offspring that survive to have offspring themselves). He should have referred (on page 3) to the desirability of minimizing the variance in the number of *surviving* offspring instead of "the number of offspring."

Chisholm's argument for increasing the number of offspring in adverse times leaves out the effect on survival rates of dividing the parental investment among more offspring. A little reflection will show that a death before reproduction is logically equivalent to not having been born. Increasing fertility at the expense of offspring mortality is likely to be counterproductive. Instead, in adverse times, substituting parental investment for mating effort would minimize variance in reproductive success by giving the reduced number of offspring a higher survival probability.

In the paper on the Great Tit (which feeds its offspring after birth) which Chisholm cites (Boyce & Perrins 1987), large clutch size (high fertility) results in less food per offspring and lower survival chances for each offspring. It is documented that the offspring of large clutches fare especially poorly in harsh years (when the parents have to divide the food they bring to the nest among more offspring). The optimal number of offspring (fertility) is lower in harsh years. In humans, who also care for their young, a similar effect is to be expected. The production of a large number of offspring (high fertility) obliges the parents to provide less food (and other assistance) to each, and therefore increases mortality and the variance in reproductive success. Thus, this logic calls for shifting to more parental investment, not less, in times of adversity. This is the opposite of what Chisholm says.

Chisholm implies that reducing intergenerational variance is desirable only in the long run. Actually, the mathematics of maximizing the number of offspring in the distant future argues that minimizing variance (other things equal) of the product of survival rates to reproductive maturity and fertility is always desirable, including in poor times (Lewontin & Cohen 1969). The number of surviving offspring in the long run is determined by the long-run growth rate, which is the geometric average of the year-to-year growth rates. In

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calculating a geometric average, a given absolute change in the number of surviving offspring has a much greater impact in years when the growth is negative. Thus, raising the number of surviving offspring per mother from .1 to .2 has a much greater impact than raising it from 2.1 to 2.2, even though the absolute increase is only .1 in either case.

Indeed, the evidence of the cited paper on the Great Tit is that a small average clutch size reduces the risk in poor years of having more offspring than can be adequately fed. Indeed, it is in poor times that the optimal parental investment per offspring should be greatest, since it is in poor times that a species (or a population) faces the possibility of extinction. If a generation of offspring is lost due to inadequate parental assistance, it may take many generations for the population to recover.

As noted, Chisholm seems to be arguing for increased reproductive effort during hard times. But with humans hard times are likely to be associated with increased competition from other humans. However, the life-history theory Chisholm cites would properly interpreted means that it is precisely in times of severe competition that a population should abandon the r strategy of maximizing reproduction (Macarthur and Wilson 1967) and adopt the features that make for success in competition. Even if the r/K theory is rejected in general, its logic on this point appears compelling.

There is one circumstance when it might be possible to argue that increased fertility would be a desirable response to parental stress, although Chisholm does not refer to it. This would be if parental stress induced such a high rate of mortality that it greatly reduced the population without inviting increased competition from other populations. Those who were then young would experience abundant resources in adulthood to use in rearing their own offspring. In the post-crisis conditions of resource abundance, large families and an early start at reproduction would be optimal. For instance, a plague might raise parental stress levels and drastically reduce the population with the result that the surviving generation could be expected to raise large families without fear of any shortage of resources. High fertility would be the optimal strategy. This is a possible scenario which would support the effect Chisholm hypothesizes, but it is not Chisholm's argument.

Unfortunately, the idea of reacting to adversity by increasing

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fertility in anticipation of lower competition in the future does not explain why some cultures maintain, over a long period of time, a low parental investment strategy (such as Draper 1989 describes for Africa), and others a high parental investment strategy. The goal of the original paper by Belsky, Steinberg and Draper (1991) appears to be to explain long-standing behavioral differences between cultures.

With regard to the specific proposal that parental stress lowers the age of menarche, it would seem that an optimal strategy in times of difficulty is to postpone reproduction, and devote available energy to staying alive and growing. This would call for delaying menarche.

Humans have evolved a mechanism to delay the start of reproduction during famine (Frisch 1988): females require a certain body fatness for menarche. It is easy to see how this adaptation is useful. But famine is a result of many of the stressors that Chisholm argues lower the age of menarche. It is unlikely that humans have evolved to react in opposite directions to food shortages, and to the stress accompanying such shortages.

Chisholm suggests that females have evolved to react to periods of stress by increasing mating effort. However, many periods of stress (warfare, famine, natural disasters) are short-lived. Reason would suggest that the optimal female strategy would be to postpone choosing a mate during such periods. Conditions are bad for starting a family. Postponed births probably have a low fitness cost since the child would have been at great risk of death. If the stressing events damage the child (such as by crippling it), the child's existence can actually lower the mother's fitness.

Alternative Theories

Many of the observations in Chisholm's paper could be explained by simple genetic mechanisms. In particular, personality characteristics that correspond to a high mating effort strategy appear to be inheritable. There is not space here to review the extensive behavior genetics literature showing that variance in most traits is partially genetic, but good reviews are available (Bouchard, Lykken, McGue, Segal & Tellegen 1990, Eaves, Eysenck & Martin 1989, Loehlin 1992, Rowe 1994, Rushton 1994b).

Moffit, Caspi, Belsky & Silva (1992) tested Chisholm's sociobiological model on a New Zealand data set and found most of the predictions were not sustained. However, one of the most interesting,

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that father absence and family conflict predicted early menarche, was supported. The authors state (p. 56) that "the absence of empirical support for Belsky *et al.*'s mediational model suggests that a genetic transmission model may provide a more parsimonious account of the present findings." Note that one of the authors of the original paper, Belsky, now states that a genetic transmission model provides "a more parsimonious account." Chisholm's model is essentially Belsky *et al*'s. The problem is to explain how several genetically influenced behaviors come to be associated.

Of course, one possibility is that one behavior leads more or less directly to the other. For instance, Moffit, Caspi, Belsky & Silva (1992) proposed that genetically caused early menarche can lead to earlier initiation of sexual activity, earlier marriage, earlier childbearing; because early marriages have high divorce rates in contemporary western societies, this indicates a relationship between early menarche and divorce, which is also observed across generations.

In contemporary western society, marriages where one partner is trying to obtain additional matings tend to be stressful, and more likely to end in divorce. The offspring of such unions often have inherited these same genes, and if genetic factors are involved in determining behavior, there is a probability that they in turn might practice a high mating effort strategy, which will produce stressful marriages that are more likely to end in divorce. The traits that lead to divorce appear to be highly heritable as shown by the fact that the co-twins of divorced monozygotic twins are nearly three times as likely to be divorced themselves than are the co-twins of still married twins (Lykken, Bouchard, McGue & Tellegen 1990). Thus, the finding that children who experienced the stress of marital separation when growing up are more likely to divorce themselves can be explained by simple genetic theories without recourse to elaborate developmental switches. This scenario, not discussed by Chisholm, is a very plausible hypothesis compared to his complicated account.

There is also evidence that aggressivity is partially inherited (Rushton, Fulker, Neale, Nias & Eysenck 1986), although Plomin, Nitz & Rowe (1990) found the genetic effect was weaker than for many personality variables. This predicts that children with aggressive parents who beat them may have a genetic predisposition as well as a learned inclination to beat their own children. The same is true for altruism, which may be expected to lead to high parental investment.

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The observed earlier and more aggressive sexual behavior in children raised without fathers might be genetically explained. Most cases of father absence are due to either the father never having married the mother, or due to divorce. The same genes that led to the father and mother separating may have been transmitted to the offspring, producing the differences in behavior. This hypothesis is seldom even mentioned in the literature on father absence. A genetic theory makes an interesting prediction. When the father's absence is caused by his death, the death is unlikely to be correlated with any genes in the offspring that appreciably affect behavior. Thus, if the reported differences in behavior in father-absent children are caused by certain genes common to both offspring and parents that also lead to divorce or failure to marry, these genes will be more common in the offspring of divorced or never married mothers than in the offspring of widows.

Interestingly, one study that compared the two groups of offspring found such differences (Hetherington 1972). Daughters of divorced mothers seemed to seek much more actively male company than daughters of widowed mothers (daughters in two-parent families were in between). The daughters of divorcees were shown to have poorer opinions of their father than daughters of widows had of their fathers, so the effect is probably more than simply having learned to enjoy or avoid male company. Although the author of the study did not note the possibility, the effect could simply be explained if the genes actively seeking male company, or for earlier sexual maturity (since maturation leads females to seek male company), were more common in the offspring of divorcees, and the same genes had led to their parents' divorce (possibly by leading to extra-martial affairs that had adversely affected the marriage). The differences between children of widows and children of two-parent families are unlikely to reflect common genes, and are more likely to measure the direct effects of loss of a father (such as less exposure to males and their activities).

This same methodology might also be used to see if other differences in behavior between children raised with two parents and children raised in the absence of a father are based on common genes, or can be truly traced to the absence of a father.

Theories that use genetics to explain certain patterns that run in families and are similar among cultures must explain why certain genes came to be found together. Fortunately, there are two such

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theories available, both based on life cycle theory.

Differential K Theory

The perceptive reader may notice the resemblance in Chisholm's theory to Ellis's (1987) and Rushton's (1985, 1987, 1988, 1989) differential K selection concepts, although neither is cited. Interestingly, Chisholm himself has elsewhere (Chisholm 1988) applied the r/K theory to humans. The apparent goal of Chisholm's (1993) paper was to show how life history theory can be useful without adopting genetic determinism, as shown by the first sentence which states: "Many social scientists reject evolutionary views of human behavior because of their supposed genetic determinism." The facts that his theory attempts to explain apparently include many of the facts that Rushton has attempted to explain in his aforementioned articles, and in his recent book (1994b), although Rushton is not referred to. The omission is striking, since Rushton is the major author who has tried to apply life history theory to humans. This may be another example of the prejudice of many academics against genetically based theories of why populations differ in behavior (see Pearson 1991, for other examples.)

Rushton, also using life cycle theory, argues that certain traits that contribute to fast population growth tend to occur together. These are called r traits in biology. Biologists call traits that contribute to winning at competition for resources K traits. The latter typically include those to which high parental investment contributes. Rushton argues the associations exist at both the individual level (Rushton 1992) and between different populations or races. His underlying model is that most of these traits are heavily genetically influenced, and that where one physical mechanism did not produce several effects, evolution caused the genes for certain traits to be associated with each other. He shows that many traits are ordered in different races such that Negroids are more r, and Mongoloids more K, with Caucasoids in between.

A Paternal Investment Theory

Many of the observed differences between cultures can be explained by life history theory, but without the elaborate mechanism proposed by Chisholm. The author has shown elsewhere (Miller 1994) the many behavioral differences that can be explained by a

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simple genetic hypothesis which uses the idea of a male tradeoff between parental and mating efforts during the hunter-gatherer conditions under which modern humans evolved over thousands of generations. In hunter-gatherer economies the optimal male position on the parental investment versus mating effort continuum depended on the environmental and climatic circumstances. Although in recent decades hunter-gatherer societies have mostly survived in marginal environmental conditions where agriculture was not practicable, it must be remembered that prior to the Neolithic most human ancestors occupied the more favorable climatic regions, where food was readily available. In favorable hunter-gathering conditions most nutrition is derived from gathering (Lee 1968). Women do most of the gathering, while devoting only a few hours per day to the effort. This implies that a female can feed herself and her children by herself, even if her mate devotes little effort to assisting her.

However, in cold climates with a winter, there are few opportunities for female food gathering during the winter. The major source of winter food is the hunting of large game, such as deer. For obvious reasons (imagine hunting with a crying child) such hunting is a male activity. Northern males who did not provide for their children left fewer descendants. Northern females who had children fathered by males who had not proven their willingness to pair bond and assist in supporting their offspring left fewer descendants. Any southern females who were exceptionally "picky" (such as requiring a period of courtship) about their mates started child-bearing later and would likely have fewer offspring.

The greater reproductive success of tropical males with genes conducive to mating success and of northern males with genes conducive to paternal investing (through provisioning) would likely have resulted in regional differences in gene frequencies. Behavior genetics shows that human populations display genetic variability in many personality traits for natural selection to act on (see above citation on behavior genetics).

Mating is assisted by a strong sex drive, aggression, dominance, sociability, extraversion, impulsiveness, and high testosterone. Provisioning is assisted by altruism, empathy, behavioral restraint, and a long life span. However the theory goes beyond predicting behavioral differences from climatic and related environmental differences. If paternal provisioning is required for offspring survival,

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the death of a male will have more of an adverse effect on fitness in a northern climate than in a southern climate, and northern males will be selected for a longer life span. This is observed. There is not space here to provide citations for the existence of all of these racial differences (see Miller 1994).

Perhaps the simplest prediction of the model is that males may be genetically less inclined to be closely tied to their mates in populations which have evolved in fertile tropical environments where, even after the advent of horticulture, women were the prime food-providers. Such a genetic predisposition could contribute to the very high illegitimacy rates among American blacks (66.7% of black women who bore a child in 1993 were unmarried, versus 16.9% of whites, and 6.9% of Asians and Pacific Islanders [Bachu 1993, Table B]). Although the percentage of children living in families headed by women has been increasing among both blacks and whites, it has been consistently higher in whites than in blacks (Morgan, McDaniel, Miller & Preston 1993). Weaker pair bonding in blacks is also shown by appreciably higher divorce rates (Staples & Johnson 1993, p. 163). Needless to say, in advancing such a hypothesis one should not discard all environmental and historical factors. Indeed, these might well be stronger than any genetic predisposition, even if our genetic hypothesis has any validity. But this does not mean that genetic factors may not be involved to some degree. The concept, although very difficult to test, is worthy of further examination.

Testing the above theoretical argument would ideally require records of mating patterns going back thousands of years. Of course there are no written records of prehistoric matings. However, modern molecular genetics provides evidence for the antiquity of the differences between European and African mating patterns. A sharp distinction between Caucasoids and Africans has been found using markers on the Y chromosome. The Y chromosome is inherited only in the paternal line. "A haplotype ($A_1C_0D_0$) absent in Caucasoids and present in the majority of the Africans examined has been identified" (Torroni, Semino, Scozzari, Sirugo, Spedini, Abbas, Fellous, and Santachiara Benerecetti, 1990). Indeed, if the mutations that gave rise to this haplotype had occurred only once, it appears that the majority of the West Africans examined are descendants of the male in which this mutation first occurred.

The same populations have also been studied for mitochondrial

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DNA polymorphisms. These studies did find a mitochondrial DNA type peculiar to Senegalese Africans. However, overall the Africans studies were more heterogeneous than the Italians (Torroni, et al. 1990, p. 95), as shown by lower values of a statistic for measuring homogeneity (Fs= the sum of the squares of the frequencies for all of the haplotypes) that was .390 for Italians versus .237 and .232 for the Wolof and Peuls of Senegal respectively). However the studies of the Y chromosome showed a much higher degree of homogeneity in the Africans (.478) than in the Italians (.118). How is this to be explained?

The authors note (Torroni, et al. 1990, p. 295) "This discrepancy could be, at least partially, explained by polygamy which is in use among these people. Only certain men (the richest) can have several women and thus contribute to the next generation more than do other men." This explains why the number of different men who have left descendants in the sampled populations in Africa is much less than the number of different women. Thus, through the use of modern molecular genetics we now have evidence that differences between Africans and Caucasoid mating patterns (or strictly speaking in the success of certain men in mating with women) have existed for very long periods of time.

At least one other marker on the Y chromosome (the YAP marker) has recently been reported (Hammer, September 1994) to be frequent in African populations (74%), but rarer (4% in Asians and 7% in Europeans) in most non-Africans (except Japanese). If the YAP marker were the result of a single mutation, which is probable, the high levels of this marker in Africans would indicate that one ancient African male and his descendants had had a very high level of reproductive success, with the original individual being the paternal ancestor of about three quarters of the 611 Africans sampled.

Finally, it should be noted that if natural selection has produced differences in the gene frequencies affecting parental investment and the desire for multiple mating, these differences would have continued to operate even under changed environmental conditions. Evidence in support of the hypothesis can be found when comparing the behavior of different races in agricultural societies. Variations in the frequency of polygyny can be compared with the ecological and climatic conditions under which the disparate racial stocks of the world are known to have evolved. Polygyny is most common in

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Africa, and a pattern of low male parental investment exists in African origin populations in the Caribbean (Smith 1962, Roberts & Sinclair 1978), including a high rate of mate-changing (see Otterbein 1965, Table 1, column 4 for the percentage in many societies). The low rate of enduring monogamous marriages among African-Americans in the U.S. and the Caribbean has been blamed on their earlier enslavement and the forced cultural change that is believed to have destroyed much of their original African culture. However, polygyny was a part of the traditional culture of their ancestors, and since their arrival in the New World, they have lived amid whites whose culture emphasized monogamy. An environmentalist argument would suggest that their previous preference for polygyny should have been replaced by a new preference for monogamous pair-bonding; but this has only been partially realized, and one cannot rule out the possibility of an evolutionary-based genetic predisposition among Afro-American males favoring a high mating effort rather than a high parenting strategy as an explanation for the reappearance of African patterns.

Low paternal investment in tropical origin populations suggests that males will devote less effort to gathering or growing foods to support their families, especially through the low prestige route of gathering. A low level of male provisioning appears to have existed in sub-Saharan Africa both pre- and post-horticulture. After the adoption of horticulture the African practice whereby the females provide most of the food remained. Indeed, widespread polygyny would not have been practical in such conditions if a man had to provide enough food to support several wives and their children. Even in contemporary Africa, the women appear to be more industrious than the men (Lamb 1987, p. 38) and grow most of the food. The African populations brought to the Caribbean have continued the pattern of weak pair bonding with the men supplying relatively little support for their offspring (Roberts & Sinclair 1978). Women have had to undertake the major responsibility for providing food for their families.

Although most American blacks are now urban, the females continue to provide important financial support for their families, and in a vast number of cases are the sole provider. Even when there is a marriage, the black woman is more likely to be the working partner. In the United States, black females have greater occupational and

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educational success relative to black males than white females do relative to white males (see Taylor 1992, p. 25). Black females earn 99.0% of white female annual earnings, versus the 64.6% of white male earnings earned by black males (Jaynes & Williams 1989, Table 6-5). The personality traits African females required to feed their families in Africa, both in pre-horticultural and in horticultural times (notably consistent, continuous effort), are more consistent with occupational and educational success in an industrial society than those required by males to enable them to achieve multiple matings (aggression, for instance). African females without these traits would have left fewer descendants.

If tropical origin males were selected to devote their efforts to seeking mates rather than providing for their mates and offspring, we would expect to find them stronger in traits such as aggression, dominance-seeking, sensation-seeking, and low anxiety. Research indicates that this is the case (Rushton 1994, Miller 1994). These traits lead to an active drive to achieve dominance over other males, and a willingness to use force to keep other males at bay while competing for access to potential mates. Thus, a willingness and ability to fight are selected for. These activities (and seeking additional matings) call for risk-taking, which is facilitated by low anxiety, and a willingness to act on impulse. Selection for mate-seeking would be expected to be associated with high testosterone levels (Ellis & Nyborg 1992, Lynn 1990), and lower monamine oxidase levels (Ellis 1991).

A number of measurable physical traits in blacks are consistent with selection for aggression, such as a generally more masculine body build (Laska-Mierzejewska 1982). Black soldiers (males) have been found in two studies to be more mesomorphic (and less endomorphic) than white soldiers, with the difference being more than one standard deviation (Damon, Bleibtreu, Elliot & Giles 1962, Table 2). Other Afro-American male traits which may have been affected by selection for fighting include high testosterone and lower monamine oxidase levels, and denser bones (Himes 1988, Pollitzer and Anderson 1989). Ama, Simonau, Boulay, Serresse, Theriault, and Bouchard (1986) found African blacks to have less type I muscle fibers, more type IIa and lower activity in enzyme catalyzing reaction in phosphagenic and lactase dehydrogenase metabolic pathways. These were interpreted as likely to be inherited, and suggested that

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blacks would exhibit better performance in sports requiring a short duration of exertion. Indeed, blacks have been found to exhibit better performance at activities requiring quick spurts of energy, such as sprints and jumping (Malina 1988).

Worthy (1977, chapter 2; Worthy & Markle 1970) has shown systematic differences in the sport positions played by blacks and whites, such that blacks are more successful where the positions require reacting properly to the opponents' actions, while whites do better where the player initiates his own motions, as in baseball pitching, marksmanship, or in shooting a basketball free goal. Fighting was probably the activity that selected for the black pattern of reacting. A similar correlation was found to exist between these abilities and eye color, suggesting the differences were evolved rather than being environmental, since only evolution could explain the eye color correlation among Caucasoids (Worthy 1977).

The same personality traits that lead to success in competition for mates – aggressivity, lack of inhibition, willingness to take risks, ability and willingness to fight – are those most likely to be associated with criminal violence in modern industrial societies. Not surprisingly blacks have higher rates of participation in violent crime in North America, followed by the Caucasoids, and then by Mongoloids (Jaynes & Williams 1989, Wilson & Herrnstein 1985, Rushton 1994b). No means have yet been devised to determine whether these statistics are due more to environmental factors or to genetic factors.

The genetic hypothesis would predict that rates of rape would be higher among populations of tropical origin. Rape is known to be more frequent among blacks than Caucasoids (Brownmiller 1975, pp. 213-216; Ellis 1989, p. 94). Child abuse is another form of crime. Abusing a child is the opposite of investing in it. If cold climate fathers were selected for paternal investment, their descendants should commit less child abuse. Caucasoids in contemporary American society have lower child abuse rates than blacks (Ellis 1987, p. 159), and the rate among Americans of Mongoloid descent are even lower (Ellis 1993, p. 171).

Cultural differences cannot be deduced to explain such measurable physical traits as salt retention rates (predicted to be lower in northern populations who consume more salt-containing meat), monamine oxidase levels (contributing to differences in aggression), differences in frequencies of type I versus type II muscle fibers, bone

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density, general masculinarity of body build. One cannot and should not rule out possible alternative explanations for these differences, but the evolutionary hypothesis has the advantage of economy. Instead of separate ad hoc explanations for every trait, a single theory can explain much of the varied patterns of behavior which distinguish the races and the possibility that genetic factors contribute to behavioral differences cannot be discarded without deeper examination.

It might be noted that the paternal investment theory is part of broader evolutionary theory, which is that the genetic differences between populations or subspecies are due to natural selection favoring different traits in contrasting climatic and ecological environments. It has been long accepted that visible traits such as pigmentation and thickness of skin are the result of adaptations to aspects of climate such as ultraviolet exposure (Brues 1990). However, Lynn claims that differences in intelligence can be explained by evolutionary selection, and that northern climates placed a premium on higher intelligence for survival (Lynn 1991a, 1991b), because of the need for such things as planning the storage of food for survival in winter (Miller 1991).

With the exception of Ellis's (1987) and Rushton's (1994a, 1994b) differential K selection hypotheses (which fail to explain convincingly why some races should be more K-selected [Miller, 1993]), no other theory appears able to explain so many regional behavioral differences. Thus, Chisholm would appear to be correct in claiming that life cycle theory can be applied to humans, and that it can explain many observations relevant to anthropology. However, we believe that Chisholm is too quick to dismiss simple natural selection models as the source of the phenomena associated with that theory.

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A Monumental Prehistoric Germanic Labyrinth Decoded

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Introduction

The typical ancient rock-carved labyrinth with cup-and-ring pattern has a central depression surrounded by a varying number of concentric, full or partial rings. The rings are often interconnected by a straight line running from the center to the outside ring. Such carvings are found at Old Berwick, Northumberland, and at Roughting Linn and Ilkley Moor in Yorkshire, among other sites. The concentration of ancient spiral carvings with cup-and-ring marks in the British Isles is at Auchnabreck, Argyll, in Scotland, and Loughcrew, Co. Meath, in Ireland. While the majority feature a single straight line from the center to the outside of the rings, which vary from two to five in number, the rock carving on Arran at Strowach Ridge, has a pattern of eight rings and, from the center, one line running diagonally downwards and one running radially toward the upper left. A similar pattern is found in Spain, at Mogor, near Marin, Pontevedra Province.

Schalkenburg – A Prehistoric Observatory

In a manner reminiscent of the discovery of the three-dimensional labyrinth on the ancient holy hill of Glastonbury in Somerset, German archaeologists some years ago identified a sacred hill, Schalkenburg, near Quenstedt. It is part of the eastern prolongation of the Harz Mountains of Westphalia, and lies between Aschersleben and Hettstedt, rising about 25 meters above the valley Hengstbachtal. Here are found five oval rings with, as was the case at Arran and Mogor, openings in the rings to create three pathways. Two of these can be associated as a diametrical line running on a north-south path, while the third, a radial line, runs east-west and ends on a steep face of the rock. Given the inaccessibility of end-point of this radial, it has been concluded that this could not have represented an entrance toward the center. On the other hand, the northern end of the full diagonal runs out into the surrounding landscape and may more properly be identified as an entry point into the complex.

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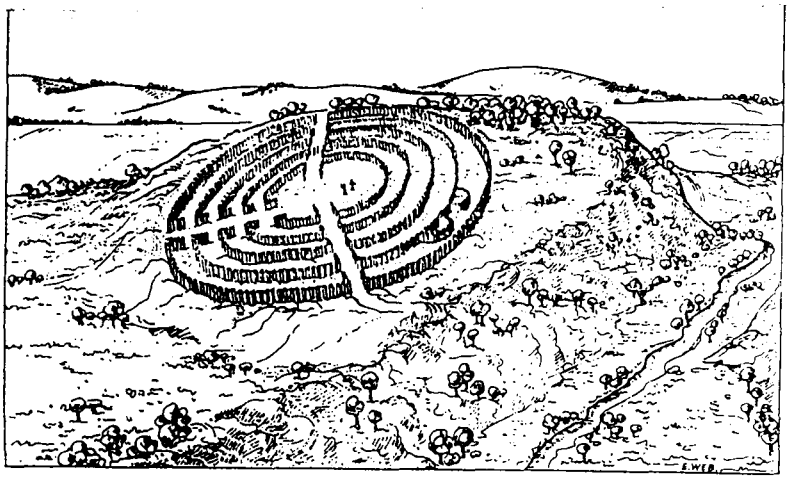

A reconstruction of the wooden palisade of the Schalkenburg.

The 35 by 95-meter diameters of the labyrinth are testimony to its monumental proportions. The outermost ring of the Schalkenburg has an exterior diameter of 120 meters and an interior diameter of 90 meters. For the innermost ring the proportions are 45 and 35 meters, respectively. The total length of the course of the five circles is about 1000 meters. The distance between rings varies between 4 and 6 meters, 5-6 in the upper part of the structure and 4-5 in the lower. The soil layers which excavators at the Schalkenburg met showed dark, round discolorations, 10-20 cm in diameter, indicating the earlier presence of logs from about 5,000 tree-trunks. Estimations of the depth to which the logs were set suggest that about two meters would have projected above ground. An enormous effort would have been required to fell, trim and transport the 500 tree-trunks to the top of the hill, excavation the pits and erect the five geometrical palisades. With the stone and wooden tools of the period, the structure must have taken decades to complete.

Excavations at the Schalkenburg site were carried out over two decades, between 1967 and 1987. Weapons, tools, pottery, ornaments, bones, pieces of wood and pollen from middens and graves have permitted radio-carbon dating, with the majority of finds falling in the period between 3,000 BC and the beginning of the

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Christian era.

Around 2,500 BC – the Hallstadt period – a village was located on the hill. Graves and grave-goods establish that on two occasions the Schalkenburg was used as a cemetery. The 12 youngest graves, dug some 3,500 years ago, are from the Bronze Age and represent the German Anjetitzer culture. Five hundred years or so earlier, 22 persons were buried during the Neolithic Age (Bernburger culture). Plant cultivation supplemented hunting in this period. Settlement at the site, however, can be pushed back to 4,500 BC.

Findings at the hill and nearby sites, pointing as they do to very early settlement, make the Schalkenburg one of the most important prehistoric sites in central Germany. The circular sanctuary offers proof of settlement and grave-goods from the Neolithic, Bronze and Iron Ages, while the following in the immediate vicinity point to cultural traditions almost as old.

1. The southern entrance to the village of Quenstedt has a Neolithic settlement.
2. The Kahlenberg has Neolithic urn graves.
3. The Kleine Höhe has a Neolithic settlement.
4. A Neolithic cairn has been found near the present-day kindergarten.
5. An earlier playing field has Bronze Age cairns.
6. The area by the Reesbach gives evidence of a Bronze Age comb workshop.
7. A Bronze Age cemetery has been found near Klingerborn.
8. Bronze Age cairns are found near the Steinberg.
9. Near the road crossing at Dorfstätte, perhaps the predecessor of Quenstedt, are traces of a settlement from the Migration Period.
10. Stones dedicated to Donar or thought to be altar stones in the crypt under the local church are from this same period.

Astronomical Alignment

From the center of the Schalkenburg complex, one of the openings is toward the north-east, toward present-day Quenstedt, a second is to the north-west, toward Schillingsberg, and a third toward the south, passing close to the modern Pfersdorf. Erhard Schröter has investigated the alignment of the symbol and considers the two poles of the diametrical passageway as an indication of the entry as

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well as lines of sight for astronomical observation.[1] These openings direct the sight of the observer at the center to the points on the horizon where the sun rises and sets on 21 June, the beginning of Summer. Sun-rise and sun-set have a strong northern orientation at this time of the year, as the sun reaches its maximum annual midday elevation of 61 degrees. The significance of the third opening through the palisade rings has not, however, been adequately explained. It may have been the night sky which determined this third orientation.

5-6,000 years ago the celestial North Pole lay considerably farther away from today's Pole Star, in the constellation Draco whose brightest star may be assumed to have then played the role of pole star. And, according to the Astronautical Planetarium at Halle and the calculations made by Karl Kockel, at about ten o'clock in the evening on the eve of the summer solstice, the Southern Cross was visible close to the horizon.

There is little doubt that the people of the Neolithic Age observed regularities in the course of the sun, although their explanation would have differed from ours. The acts of supernatural beings accounted for the phenomena which we ascribe to natural laws. Suggestions that the Schalkenburg was a cult site are encouraged by traditions associated with the neighboring church at Quenstedt. The pagan gods Donar and Freya are mentioned along with Christ in a 1236 document and Quenstedt is identified in the German annals as the location of the Swabian cult and assembly site. At the same time Quenstedt is one of the earliest Christian sites in Germany, having as patron saint Boniface, the founder of the Church on German soil, and had a documented abbot and church founder, Sturm, as early as 779.

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[1]The German astronomers, J. Lichtenfeld and G. Schön, assessed the proposed entrance as follows (in paraphrase): With the aid of the planetarium it has been possible to relocate the celestial North Pole to its situation some 6,000 years ago, the period of construction at this site. We found that after sunset at the summer solstice the first constellation to appear was the Summer Triangle formed by Deneb, Vega and Atair, with its lower point high above the south-eastern entrance. By switching the pole at the same time of the year it was possible at dawn to observe the Southern Cross flat on the horizon at the south-eastern entrance, a sighting no longer possible at our latitude today. This should be considered a working hypothesis, which may have far-reaching implications.

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Older than Stonehenge, the Pyramids and Ziggurats

Coincident with the excavations at the Westphalian Schalkenburg, archaeologists in Bavaria, with the aid of geophysical prospecting techniques, discovered six additional hill sites between the mouths of the rivers Inn and Isar, at the edge of the Danube Valley, and a seventh near Vischt, south of Landshut. The Volkssternwarte München and Bayerische Landesamt für Denkmalpflege held an exhibition in October, 1992, at Rosenheim, Bavaria, which published these Mesolithic sites between Künzing-Unternberg and Landau-Kothingeichendorf. The exhibition contended that these sites could be considered prehistoric "cities" of the fifth millennium. Calculations were similar to those that Alexander Thom applied to British sites and the methodology relied on aerial archaeology and geo-magnetism.

These sites, like the Schalkenburg, take the form of circular ditches of about one meter's depth, ten meters in diameter, with a palisade on the inner side. Here too the "entrance" axes have been aligned with rising sun at the solstice or equinox and it seems legitimate to identify these "sun temples" as cult sites.

In the case of the Landau-Meistern site it is of interest to note that in addition to the astronomical alignments, the neolithic ell (0.831m) is at the basis of dimensions, as is the case at Stonehenge. But the presence of spiral carvings and the results of carbon testing and dendrochronology permit quite exact dating to the fifth millennium B.C., that is, approximately 2,000 years before the erection of Stonehenge.

Some years ago Swedish astronomers studying rock carvings on the island of Gotland that had earlier been identified as grooves resulting from the sharpening of Viking Age swords discovered to their surprise that startling alignments could be established once allowance had been made for likely dates and shifting star patterns. Some alignments were dated to the vernal equinox of 3152 B.C., the day of the passage of the full moon across Antares in the constellation Scorpio. This brief overview complements the evidence from Carnac in Brittany and other sites in France, Britain, Germany and Sweden to establish the astronomical sophistication of their early inhabitants and obviate Roman claims for an Egyptian, Sumerian or Babylonian origin for this early science.

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Juvenile Grave Goods from the South Russian Steppe during the Eneolithic and Early Bronze Age

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Our knowledge of the Eneolithic and Early Bronze Age of the South Russian steppe comes primarily from excavations of the thousands of kurgans which cover the area. Settlement sites are scarce in the extreme, and we are, therefore, dependent on graves and what they produce in order to attempt any sort of investigation of this time period. This paper looks at Yamnaya and Catacomb burials from the Volgograd Region and is an outgrowth of a catalogue which is being created of the pottery of that region which is housed in the Volgograd Regional History and Cultural Museum (Jones-Bley forthcoming). The Eneolithic in the Volgograd area is represented by the Yamnaya culture and the Early Bronze Age by the Catacomb, two groups that are regarded by many scholars as some of the earliest Indo-European speakers. The nature of the societies that produced these burial traditions and their subsequent social evolution are thus of great interest in examining the beginnings and nature of IE beliefs and customs.

225 graves are considered in this study. This is the number of graves in the region that contained a piece of pottery. The vessels are broken down into four categories: pots, braziers, tureens, and censers (or smoking pots). The pot is the most ordinary vessel. Yamnaya pots usually have pointy bottoms while Catacomb pot bottoms are almost always flat. Jugs, which have one or two handles, are considered a subset of pots. A brazier is defined as either the bottom or side wall of a large pot and usually has evidence of burning inside. (There is no report of the substance that was burned.) A tureen is a vessel with a very wide rim but low in height, and a censer is a special vessel which usually stands on three or four legs that are fused together and most often have a small inner compartment. The larger compartment of the censers almost always has evidence of burning. A small amount of pottery was imported from the Cauca-

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sus; otherwise, all appears to be locally made (Jones-Bley forthcoming).

Non-ceramic grave goods, which are the focus of this paper, include astragali and other animal bones; sheep and cow are the most prominent, but horse remains are also present. There is, in addition, a variety of artifacts made of bone. Metal items include bronze knives, points, awls, bracelets, beads, pendants, earrings, and, occasionally, silver pendants and earrings. The stone tools comprise maceheads, axeheads, millstones, abrasive stones, and arrowheads. Ochre, chalk, and charcoal are also frequently seen in the graves. One last item not listed among the ceramics are the interesting, but rare, clay funnels.

Ideally, all skeletons would have been anthropologically sexed, but this is not the case. Skeletons have, however, often been designated male or female by the excavators and this presents further problems. First, not all skeletons have been labeled, and second, the criteria for these designations are unknown. The gender determination is often intuitively based on the excavators' experience, and although I don't believe the designations of the excavators should be ignored, they must be used with caution. I have therefore used this information, but as will be seen this is not crucial to this paper.

What does not need anthropological investigation is whether or not a skeleton is a juvenile, and it is here that I have taken the closest look for present purposes. Of the 225 graves from the Volgograd Region, there are 25 graves for which we have no indication of age or sex of the occupant. Reasons for this vary from the bones being a jumble, the excavator not recording any bones or no bones present, or the possibility of the grave being a cenotaph. Cenotaphs are not an uncommon element in Catacomb cemeteries (Mallory 1990: 27). Of the remaining 200 graves, there are 17 graves that contain adults and juveniles; 69 graves have skeletons classed as juveniles only (babies, children, or adolescents (13 Yamnaya and 56 Catacomb); and 114 graves with adults only. Thus 43% of the graves for which we can say something about age contain juveniles, and of the graves that are exclusively adult or juvenile, 38% are juvenile.

Let us then look at these non-adults and compare what they are given to take to the otherworld with what is given to adults.

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Yamnaya

To consider first the earlier Yamnaya period, all graves contained only one skeleton. We have 27 graves with pottery and of these two have no information about the bones. Of the remaining 25, 12 are adults and 13 are babies, children, or adolescents. That is, a bare minimum of 50% of the total number of pottery-bearing graves contain juveniles. In these juvenile graves a pottery vessel is usually the only grave good aside from ochre which is frequently present. In three of the juvenile graves two vessels (one has a pot and a brazier) were present, and in one grave with a single pot, three fox jaws (a rare find) were also present.

Adult graves also contain few items beyond pottery, but one very late Yamnaya grave contained a bronze knife, a drilled stone ax, flint scrapper, and a piece of sulfur. Another unusual grave contained a copper knife and a funnel.[1]

Table 1
Finds from Yamnaya Juvenile and Adult Graves

Juveniles	*Adults*
shell	drilled stone ax
sheep bones	bronze knife
charcoal	bronze pin
organic matter	flint scrapper
chalk	silver earring
ochre	sulfur
fox jaws	chalk
ram skull	wood
	charcoal
	organic matter
	ochre

Catacomb

Things are considerably more complicated when we look at the later Catacomb period. Here there are 73 graves with babies,

[1]This is an interesting grave as funnels are considered an exclusively Catacomb item (Jones-Bley forthcoming).

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children, or adolescents.[2] Of these, 17 are graves with juveniles and adults buried together and 56 juveniles without adults. Of the 56 graves without adults, 16 graves had just adolescents (including one grave with two adolescents), 28 with children alone (including one grave with three children), and 12 with babies alone (including one grave with two babies).

As noted, multiple skeletons are quite common in Catacomb graves, but it should be stressed that all skeletons were placed in the grave at one time, and these should not be considered communal graves in the sense that the graves were used repeatedly over some period of time. The feature of repeated use has been viewed as a diagnostic of non-IE graves (Jones-Bley 1990).

Babies

Looking first at the babies, which are here defined as up to two years of age, we see that all 11 graves of single babies contained at least one piece of pottery and one grave held three vessels (two pots and a brazier).[3] An interesting grave at Tsatsa held the skeletons of two babies, two cups, and two additional vessels. This grave also contained two astragali, one ram tooth, and one horse tooth (Shilov 1985). This is a rare if not unique case of what appears to be goods paired exactly with the occupants, and has led me to wonder whether these babies might have been twins.

In addition to pottery vessels, there were few other goods aside from ochre and animal bones but a greater variety than found in Yamnaya graves. One rather rich grave contained sheep's leg bones, ochre, and two silver pendants. Only one other baby's grave contained any metal items, and these were a few bronze beads. The finds from the 12 graves with a total of 13 babies can be seen in Table 2.

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[2]There is a fair amount of discussion about the designation of the Poltovka graves. Because of this, and the fact that there are at most five in this collection, Poltovka graves are here counted with Catacomb graves.

[3]When the excavator's report listed a grave as of baby or child, I have placed it in the child category.

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Table 2
Finds from Catacomb Baby Graves

Item	*No. of Items*	*No.of Graves*
pots (including a jug)	13	12
brazier	2	2
cups	2	1
silver pendants	2	1
bronze beads	several	1
bronze pendant	1	1
astragali	3-10	3
animal teeth	2	1
one ram and one horse		
fishing weight	1	1
piece of sandstone	1	1
horn bead	1	1
realgar	1	1
ochre	-	5
shell	1	1
chalk pieces	-	1
charcoal	3	1
animal bone	-	5
ram, sheep (including jaw and leg), goat skull, mammal skull (unidentified), unidentified animal bone		

Children

Over half (28) of the graves that contained only juveniles were occupied by those classed as children, here defined as of ages two to eleven. Nine of these 28 graves contained more that one piece of pottery. This number includes a single grave which contained three children and three pots as well as a brazier, bronze pin, and 20 astragali. Eight of the 28 graves contained braziers, one contained a tureen, and three graves each contained a censer. Two of the graves with censers did not have any other pottery.

Seven of the 28 graves contained bronze items – either pendants, beads, or pins – and one grave of a child contained a silver earring

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(or hair-ring). One particularly wealthy grave of a child, five to seven years old, contained, along with a pottery vessel, pieces of charcoal, 12 astragali, five beads, three fragments of bronze pendants, fragments of a wooden pot with bronze studs, and pieces of wooden posts. Another fairly wealthy child's grave contained, in addition to a pot, three bone plaques, a small bone pendant, a piece of shell, and a small piece of ochre.

Table 3
Finds from Catacomb Child Graves

Item	*No. of Items*	*No.of Graves*
pots	29	24
braziers	8	7
tureens	1	1
censers	3	3
bronze pendants	6	5
bronze beads	3	2
bronze pins	1	1
silver earring or hair-ring	1	1
astragali	127	16
ochre	-	11
spindle whorl	1	1
flint flakes	1	1
shells	2	2
bone plaques	1	1
bone pendants	1	1
charcoal	2	2
chalk	4	4
wood pot with bronze studs	1	1
wood posts	1	1
bone rings	5	1
organic layer	-	2
animal bones sheep and small animal	-	9

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Adolescents

There were 16 graves which contained only adolescents. One cautionary note is that obviously at the upper range of adolescence the difference between adolescents and adults becomes blurred as in one case at the site of Oreshkin (D'yachenko 1992: 86), which is listed by the excavator as an adolescent or female. I have listed it as an adult because of the excavator's suggestion that it might be a female. Two of these 17 graves contained more than one vessel, each containing two pots. Of the four graves that contained bronze, two contained awls. Here we see tools for the first time although one child grave did contain a hammer-shaped pendant made of bronze. It should be noted that the Oreshkin grave mentioned above also contained an awl, bronze beads, a pin, and a knife.

Table 4
Finds from Catacomb Adolescent Graves

Item	*No. of Items*	*No.of Graves*
pot	12	11
including one jug		
braziers	3	3
bronze pendants	3	2
bronze awls	2	2
one has a pointed end and a chisel end		
astragali	13	2
bone beads	1	1
ochre	-	4
chalk	2	1
tooth pendants	2	1
organic matter	-	1
animal bone	-	6
probably ram, sheep		

One adolescent grave was extremely wealthy. It contained two pots, a barrel-shaped bone bead, two pieces of chalk, and two bronze pendant plates with loops on the upper part and bangles of balls below. One pendant is conical and on one side three spirals are

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fused with balls. On the other side is the depiction of a snake. The second pendant, which is probably copper, is shaped like an anchor with the two ends twisted into spirals, and on the lower part is a repossé decoration.

An item frequently correlated with juvenile graves are astragali (Mallory 1990: 33). In this study there were a total of 394 astragali in 43 graves.[4] The breakdown of where the astragali were found can be seen in Table 5.

Table 5
Astragali

No. of Astragali	*No. of Graves*	*Grave Type*
2	1	Baby
127	12	Child
13	2	Adolescent
33	10	Adult
118	1	Adult & Baby
45	4	Adult & Child
8	1	Adult, Baby, & Child
48	4	unknown

Despite the fact that a significant number, 10, are adult-only graves, we can see that 142 astragali are associated with juvenile only graves while only 33 are found with adults only. This would seem to indicate that there is a correlation between astragali and juvenile, primarily child, graves. The grave that held the adult (described as a female) and baby was interesting as it also contained, along with the 118 astragali, a censer, a very unusual rectangular vessel which is described by the excavator as an "offering pot," brazier, and a cow jaw. It was also the only grave in the kurgan (Kiyashko and Mamontov 1982). Both the censer and "offering pot" are extremely well made. It is curious that so many astragali would be placed in a grave

[4]Seven of these graves (four adult, two baby, and an adult and baby) contained astragali but the exact numbers are not given. The astragali are listed only as several, and because of this ambiguity I have treated them separately.

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with a baby when so few were found in the the other baby graves.

One adult grave that contained 13 astragali belonged to a male with a deformed head.[5] This seems, however, to be an unusually high number for a single adult. Usually astragali number in the low single digits or are just listed as 'several' for this type of grave. Nevertheless, a possible male grave is listed as a possible cenotaph and contained 29 astragali and a bronze knife. Moreover, the graves that contained a large number of astragali also contained more than one skeleton as can been seen in Table 6.

Table 6
Graves with Multiple Astragali

No.of Astragali	*Grave Occupants*
40	female and child
118	female and baby
16	two skeletons
20	three children
26	one child
39	one child
29	possible cenotaph

One undoubted prestige item in the inventory of the juvenile graves was silver which had to be an import, either the raw material or the article itself, due to the absence of local sources. A Caucasian source is most likely (Mallory and Huld 1984). Silver was found in only four burials: two adult graves, a child's grave, and a baby's. The latter had two silver pendants along with a somewhat ordinary pot, sheep leg bones and ochre. Silver was a rarity during the period not only in the North Pontic area but in the Balkans. Nevertheless, the objects were quite uniform, consisting only of simple crescent earrings and spiral earrings or hair-rings (Jovanović 1993: 207). Two, possibly three, of the four silver finds in this collection were spiral earrings

[5]The only other deformed skull in this collection was of a baby who was given a single vessel, two pieces of ochre, and three pieces of charcoal but no astragali (Jones-Bley forthcoming).

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(pendants) of the type described by Jovanović. The silver, however, from the baby's grave was two round disks with concentric circles in relief.

As we have seen, juveniles received a wide variety of goods. But there are certain grave goods they were not given.

1. There were 50 graves in the collection with bronze items. Fifteen of these graves contained pendants or fragments of pendants. Six of the 15 pendant graves were of babies, children, or adolescents. One of the adolescent graves contained two elaborate pendants. Pendants were in only four graves that contained just adults. There are 12 awls in the collection. Age is unknown for one grave, eight graves held adults, two graves adolescents and one grave an adult and an adolescent. Awls did not appear in children's or babies' graves.

   Bronze or copper knives, however, are found only in adult graves. There are 12 graves with knives (including two Yamnaya). Of these, there is no information on occupants of four graves; six graves have adults, one with an adult and adolescent, and one is the above mentioned Oreshkin grave (D'yachenko 1992). Mallory (1990) has also pointed to the lack of knives in juvenile graves. This study would then seem to substantiate Kleyn's (1967) assertion that knives and weapons are not found in children's graves.
2. Maceheads or axeheads, which are found here only in a small number, five, possibly six, all appear in adult graves. In one grave the skeleton is unknown but given the rest of the inventory of the grave, which is the wealthiest in the collection, I am fairly certain it contained an adult, probably a male.
3. Only adults received funnels. Although there are only three in the collection, they were all found in adult graves with otherwise unusual inventories.

Conclusions

What is necessary to remember is that this study wasdesigned around those graves that contained at least asingle piece of pottery so that we are not looking at the poorest graves. There would, of course, be graves which might have contained other items but no pottery. However, aside from animal bone, which can be interpreted in several ways, pottery is the most common grave goods. Few graves

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have additional items without pottery.

This work is still in progress, but I believe a few preliminary conclusions can be drawn which increase our knowledge of how these early people, who are thought by many to be some of the earliest IE speakers, dealt with the death of children.

1. Children are members of society and not left unburied as in many Neolithic societies (Phillips 1980: 155). At Vlasac, Nemeskeri (1976) suggests the remains of young children were thrown into the Danube, and in general there are few children buried in Neolithic cemeteries (Milisauskas 1978: 116).
2. While there is a greater variety in the Catacomb graves, juveniles from both Catacomb and Yamnaya periods were receiving a significant amount of grave goods, indicating that children held a valued place in both Yamnaya and Catacomb society.
3. Of the 69 graves in this study that held only juveniles, only four were in a central position and all dated from the Yamnaya period. Again this would seem to indicate the importance of juveniles in Yamnaya society. But does this mean there was a reduction of importance during Catacomb times?
4. Although the evidence is scant, tools seem to begin to appear only in the adolescent years, perhaps indicating that the adolescent was making the transition to full adulthood. The evidence here suggests that we might tentatively conclude that there is a hierarchy in the giving of bronze. Ornaments appear to be ubiquitous. While awls are associated with adolescents and adults, knives are apparently an exclusively adult item.
5. No specifically bovine bones were found in juvenile graves in this study, which supports Kleyn (1967) who pointed out that cattle bones were never found in juvenile graves, only in adult graves. This observation caused Mallory (1990: 30) to suggest that this may have reflected a division of labor with adults herding cattle and children sheep. It might, also, be pointed out that horse bones were not found in juvenile graves, but a horse tooth was found in a baby's grave. One would also not expect children to herd horses.
6. While frequently found in juvenile graves, astragali cannot be considered an exclusively juvenile item. Furthermore, astragali appear to be more prevalent in child graves and less so in baby and adolescent graves.

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Future work

There are a number of issues that merit closer attention:

1. What is the relationship of juveniles to adults when they share a grave? Are they parent/child? Was it coincidence that they died at the same time? Were the children sacrifices? Is there any way we can determine this?
2. Is there a hierarchy when babies and/or children share a grave with adolescents?
3. We think of adulthood beginning at the end of the teen years, but this is not necessarily true in other societies. Certainly a female can be a mother (and thus an adult) long before she is out of her teens. The age of marriage is not universally fixed. Tacitus (*Germania* 20) remarks that Germanic marriages occured later than Roman marriage. Therefore, is it possible to determine when a juvenile becomes an adult by looking at the grave goods? The awls indicate that this may be possible.

There is one critical element missing from this research. This is the element of gender. As mentioned at the beginning these skeletons were not sexed anthropologically, and thus the reason for my dealing primarily with juveniles. But even here the gender of the juveniles would give us important information. Were boys and girls treated equally or unequally? Were both sexes being buried or are we looking at only one sex of juvenile? Assigning sex to skeletal remains requires specialized training and until recently it could be carried out only on adult skeletons in a fairly good state of preservation. Recent work with DNA promises better results for less well preserved remains. It would also aid us in sexing sub-adults and enhance our ability to discuss the social position of males and females. However, even without gender this study does confirm others (see Mallory 1990) that children held solid positions in Yamnaya and Catacomb societies.

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Etrusco-Luwian Milieu of the Phaistos Disk's Greek Text

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Two crested heads from Etruria, 700-500 BCE, are identified as derived from the crested chieftain-shaman (sign 2) on the Phaistos disk. The resemblance of 14 Phaistos disk pictograms to Luwian hieroglyphs is referenced, but unlike in Greek, their Luwian acrophones do not p-alliterate as required by the verse metrics, thus eliminating Luwian as the disk's language. An amended model is proposed of a conjoint Achaean-Tursha horse-breeding culture in N.W. Anatolia during the 2nd millennium BCE, influenced by Minoan culture, following a pre-Luwian Tursha culture of Troy II and a Luwian incursion *circa* 2300 BCE.

Introduction

In my 304-page monograph (Bowden 1992) and its 38-page summary (Bowden 1993) describing alliterative verse metrics in the Phaistos disk text and the extensive Linear B relationships (*op. cit.* 1992, Chapter 3) of its deficient and quasi-consonantal syllabary (*op. cit.*, Appendix pp. 249-58), the apparent Luwian connections such as sign 24, 'Lycian hut' (*op. cit.*, p. 24 *etc.*), Luwian 7-metrical liturgy, (Watkins, pp. 58-61) and the statistically significant paucity of bare vowel-*o* on Side B (*op. cit.*, Appendix p. 258) led me to propose that the non-Greek aspects of the text originated in a joint Achaean-Luwian culture of Greek-speaking male-dominant horse pastoralists assumed to have entered N.W. Anatolia from Thrace about 1900 BCE, cohabiting with female-dominant Luwians who had already come via the Caucasus in the late 3rd millennium. The fact that 70 per cent of the 26 distinct phonemes in the extremely homophonous writing system are represented by pictograms identifiable as prototypes of Linear B signs makes Greek the most probable language of the text, in a writing system first developed in N.W. Anatolia by Mycenaeans in the 15th century BCE, two centuries later than Pernier's assumed date for the Phaistos disk, these Greeks having seen Linear A writing in Crete.

But the headcrests of Fig. 1*d* (cut from Bloch, Pl. 30; the ossuary vase has convoluted sauvastikas on the sides, probably of

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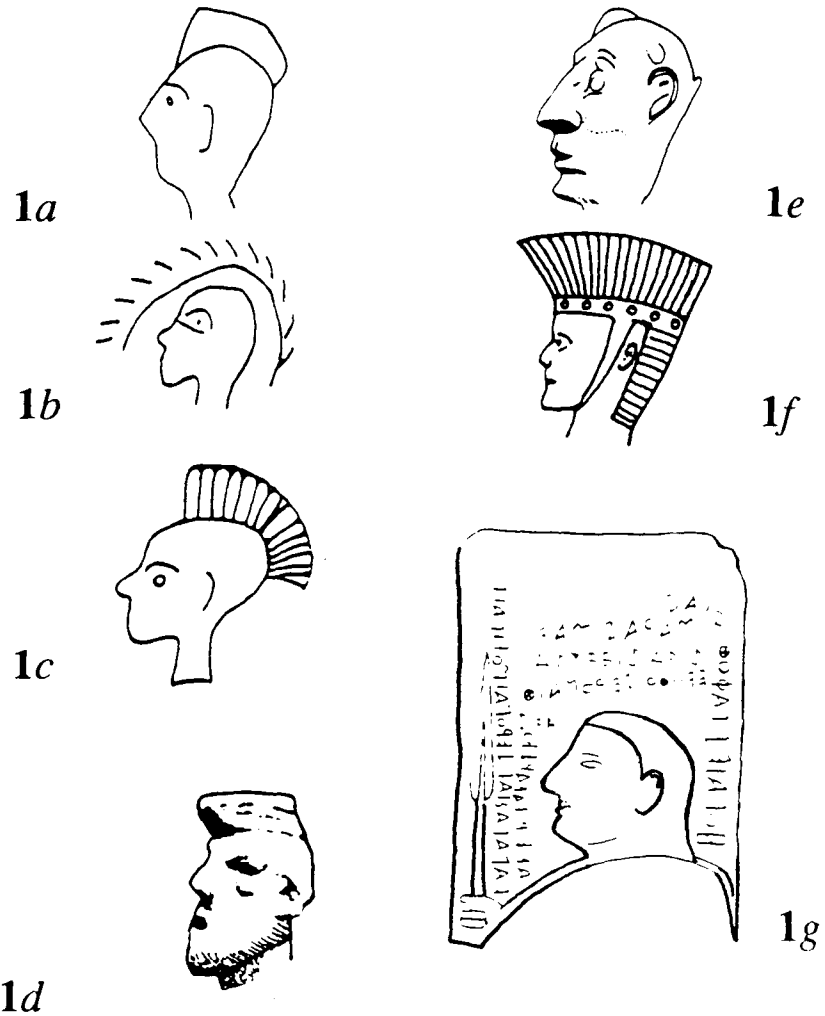

Fig 1 *a,b.* Votive figurine and hieroglyph, Crete, 2000-1700 BCE (Herakleion Museum); *c.* Phaistos disk sign 2; *d.* Etruscan crested guardian daimon on Villanovan ceramic ossuary, *circa* 700 BCE (Florence Museum); *e.* Etruscan crested bronze head, 5th century BCE (Parma Museum); *f.* Sea Peoples' feather-encircled war hat, *circa* 1190 BCE (Medinet Habu, Egypt); *g.* Lemnian funerary *stele* showing Armenoid profile of the deceased, 6th century BCE (Athens Museum).

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N.W. Anatolian derivation) and Fig. 1*e* (traced and photoreduced from Mayani, Pl. opp. p. 358) show that my horse pastoralist and Luwian interpretations can be better explained by an equidominant horse-breeding tribal society in the Troad and Arzawa of proto-Etruscans (Tursha), probably with a Greek priesthood and chieftainship, though still influenced by Luwian and Minoan cultures, especially the former. The occipital 'horn' on the Fig. 1*e* crested head is found also on Villanovan pottery cinerary urns from Etruria, habitually capped with the crested Villanovan helmet (Cary and Scullard, Fig. 2.1).

The misidentification of the sign 2 headcrest (Fig. 1*c*) with the war hat of the Sea Peoples (Fig. 1*f*) still persists after 80 years among researchers who copy uncritically from Pernier and Evans without carefully examining the Medinet Habu *bas-relief* showing a decorated circlet with upstanding feathers around it and a chinstrap and neck-guard. According to Herodotus, Lycian sailors in the 5th century BCE wore a cap "set about with feathers" (Barnett, p. 363), so these Sea People at least must have been Lycian, not Tursha.

There is sufficient archaeological and historical evidence of Etruscan horsemanship from Villanovan times (Grant, pp. 181, 213, 222, 228; Hencken, p. 87 and pp. 28, 114; Mayani, p. 103) through their reputed building of the Roman *Circus Maximus* horse racing stadium (Bonfante, p. 260) and their horse breeding (Keller, pp. 56, 127) to support my interpretation (Bowden 1992, pp. 30-32 *etc.*) of the sign 2 headcrest as a shamanistic horse's mane tribal totem symbol. Figs. 1*a,b* show that the same headcrest was to be seen also in Minoan Crete before 1700 BCE, suggesting that the men represented by this clay figurine and pictograph were visitors from Troy. A male acrobat with skull crest is also shown in a wall carving at Alaca Hüyük near Hattusas, *circa* 1550-1450 BCE (Macqueen, Fig. 137).

Although the headcrest in Fig. 1*e*, though not that in Fig. 1*d*, is a mere vestige of the prominent display a millennium earlier, it and the sloping and elongated skull of its wearer indicate a cultural link and support my previous suggestion (*op. cit.* 1992, p. 133) that the horse breeders practised infant skull binding at least in the ruling class. The strongly aquiline nose may stem from the hypothetical Armenoid pop-

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ulation substratum of Anatolia (Angel, p. 12). The same profile is seen on the funeral *stele* (Fig. 1*g*) from Lemnos, an island only 50 miles from the site of Troy, with an inscription related to Etruscan; and on the Etruscan gods *Kharun*, escort of souls to Hades (Gr. *Charon*) (Bonfante, p. 162 and Fig. VIII-50; Yonah and Shatzman, p. 267) and *Tarchun*, who may derive from the Euro-Anatolian weather god *Tarhundas* and relate to the early Etruscan aristocratic Tarquin (Etr. *Tarkhu*) family, who figure in the legendary declaration of Etruscan religious doctrine (Keller, pp. 79-80).Apparently, Etruscan society in both Anatolia and Italy comprised two distinct ethnic groups and it would not be surprising if these had originally also been linguistically distinct, which may explain the 90 per cent Indo-European vocabulary grafted onto a presumably non-Indo-European grammatical system (Carnoy; Pallottino).

Etruscan links with Anatolia

Other items that may support an Etruscan presence in N. W. Anatolia and on the Phaistos disk during the 3rd and 2nd millennia BCE are as follows, though not all have yet been fully substantiated.

1. My suggestion (*op. cit.*, p. 40) that the 31 words on either side of the Phaistos disk, with the spacing and syntax on Side B showing that one, a verb, was omitted (pp. 161, 165) by the non-Greek scribe of that side (p. 256) were related to a calendar with some 31-day months like that of Imperial Rome and that this may have been taken to Italy by Etruscans. It was whilst seeking confirmation of this hypothesis that I happened upon the Etruscan crested heads, but I have not yet found evidence in the literature for 31-day months in the Etruscan calendar.Michels traces Roman 31-day months back to the 5th century BCE but notes that the calendar's origins are lost in legend. Heurgon (p. 183) says it was taken for granted unstated by Romans that their calendar came from the Etruscans. Presumably in Anatolia the Tursha acquired the Assyrian lunisolar calendar from the Kanesh *karum*, with 12 months of 30 days each plus 5 extra days, except that someone unknown to history had distributed these 5 days to form some 31-day months by the 15th century BCE.

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2. The possibility that the complex alliterative metrics of the Phaistos disk also occur in Etruscan texts. According to Pallottino (*op.cit.*, p.155): "The presence has often been pointed out in Etruscan texts of regular groupings of words and syllables, repetitions, alliterations, rhymes, *etc.*, which point to a marked disposition for the rhythmic form". The Etruscan spiral text on both sides of the Magliano lead plaque (Strong, p. 102; Emiline Richardson, p. 218, Fig. VII - 7 in Bonfante, probably from Milani 1893, pp. 38 ff.) describes ritual cult offerings and may be a distant derivative of the Phaistos disk, but there is no evidence in it for anything more than limited non-metrical assonances. Assonant pairs of words are noted by Wellard (p.191), who on pp. 85 and 186 twice quotes, with variations indicated here in parentheses, two versions of an incantatory stanza beginning the seventh section of the Zagreb mummy-wrapping text. Each line of 7-8 words begins with: (*male*, not in first line?) *ceia hia*, followed by: *etnam ciz vacl trin vale* (or *velthre?*) / *etnam̄ ciz vacle ais vale* / *trin etnam ciz ale* / *etnam ciz vacle vile vale* /. Although there are seven v-alliterations, they are not metrically distributed; unlike the Phaistos disk the line-ends generally rhyme; and there is no half-line structure, though each line has a quasi-identical preamble. This stanza, said to be unreadable but referring to god (*ais*), could be the final debased form of a thousand year old, highly skilled and diversified alliterative metrical verse tradition exemplified on the Phaistos disk, but influenced by the same transition from alliteration to rhyming seen in Anglo-Saxon verse of the 14th century CE (Bowden 1992, p.17). Latin Saturnian verse (Harvey), two centuries later than the Magliano plaque, shows regular alliterative metre similar to that of Stanza B on the Phaistos disk (Bowden 1992 and 1993, Fig 6). Possibly the Etruscans earlier used metrical alliteration in the lyric dances of their religious cult, but it was rarely written except by Greeks a millennium earlier and by the Romans after the settlement in Italy.

3. Etruscan house-tombs (Bonfante, Fig.V-18) may derive from the 'abandoned house of the dead', sign 24, 'Lycian hut', on the Phaistos disk, later elaborated in Anatolia as the shrine of a death-cult (Bowden 1992, p.34 *etc.*), though most do not resemble sign 24 and Lycian house-tombs architecturally, so that the *concept* was borrowed, then

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reshaped during the following millennium to conform with pre-existing house styles in Etruria. One exception (Goldscheider, p. 18, Fig. *c*, wooden-hut tomb, Chiusi, 300 BCE, Berlin Museum) does show the triple-layered form of Lycian house-tombs (Bowden 1992, Fig. 12*c*). Another (Goldscheider p. 18, Fig. *d*, wooden temple, Chiusi, 500 BCE, British Museum) has Cybele seated at the temple portal and her two guardian panthers couchant on its roof (*cf. Sipulos* <**sidj-pulos*, 'she sits in the gateway', Bowden 1992, p. 205), reinforcing the likelihood of an Anatolian Etruscan origin.

4. The Etruscan skill at irrigation, drainage and canal building (Yonah and Shatzman, p. 195) may relate to my suggestion (Bowden 1992, pp. 202-8) that the Scamander estuary was periodically dredged to keep it open for the inland port of Troy.

5. The historical Etruscan practice of human sacrifice by stabbing and dismemberment (Bonfante, p. 263) may relate to Section AI of the Phaistos disk (Bowden 1992, pp. 98-9) and the suggestion of excarnation as a means of disposing of the dead (*op. cit.*, p. 53 *etc.*).

6. The renown of Etruscans as seamen and pirates (Pallottino, p. 82), who were said to have invented the ram prow, may relate to sign 25 (Bowden 1992, Fig. 20).

7. The early Etruscan use of the double-bladed battle axe (Pallottino, p. 136) may relate to words A1 and B8 on the Phaistos disk, both of them containing the non-Greek stem *labrus*, 'double-axe', with word B8 prefixed by an axe determinative as identification for Greek-speakers.

8. Palatalisation of dentals in Etruscan (Carnoy), *e.g.* I.E. *dh*- changing to *cb*-, could account for the *p*/*t* alliteration of Stanza B and Section AI, where for example Gr. *mater*, 'mother', must have been mispronounced with a medial consonant resembling a labiovelar in order to fit the overall labial alliteration attested by several of the proto-Linear B signs.

9. The statistically significant paucity of bare vowel-*o* on Side B (Bowden 1992, p. 258) corresponds to the absence of *o* in Etruscan as well as in Luwian noted in my monograph, while its presence on Side A argues against Luwian or Etruscan as the language of the Phaistos disk. Researchers who still favour Luwian as its language have not

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taken account of the complex alliterative metrics overlapping the extensive Linear B relationships, so that while the Greek dialect of the text remains undefined, there is little likelihood of a plausible cultistic and p-alliterative reading being achieved in any language as unlike Greek as Luwian. The vowel-contraction so evident in the text may not be that of an original Greek dialect, but the pronunciation, including palatalised dentals, sonant-*n* accusative endings and palatal-*l*, of an Etruscanised Greek priesthood dating from the early 15th century BCE or earlier. But it is improbable that the text is in Etruscan, because the few signs occurring as grammatical suffix-markers do so on the Greek single-suffixing principle, whereas Etruscan typically, though not invariably, uses multiple and diverse suffixes (Pallottino, p. 213) and it is implausible that a writing system so obviously Greek as this crude prototype of Linear B would be devised for writing a substantially different language. A *developed* writing system may be usable for another language, but it is not credible that one so clearly half-developed as the Phaistos disk's would have been created with Greek acrophones (except sign 24, Luw. *parna*, 'house') for the expression of a markedly different language. The possibility that the text is in Luwian can be conclusively eliminated by the resemblance of at least 14 of its pictograms to Luwian hieroglyphs (Best, *op. cit.*, pp. 30-53; and Woudhuizen. Another half dozen resemblances are discountable because unspecific or based on misidentification). Four of these 14 must be p-alliterative, because of the verse metrics, namely signs 14, 24, 27 and 29, but only one of the original Luwian acrophones is labial, as *pa* corresponding to P.D. sign 24, presumably for Luw. *parna*, 'house', as in my Greek decipherment, while the others are *tu, ku* and *u*. Evidently these Luwian hieroglyphs were borrowed by Etruscanised Achaean priest-scribes and renamed with Greek acronyms for a syllabary to write Greek, not Luwian. In any case, with a developed hieroglyphic syllabary already in use for Luwian, there would be no reason to create a substantially different version of it in northwest Anatolia merely to write a dialect of the same language, reinforcing the probability that the text is Greek.

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Conclusion

It seems that the population of west Anatolia was ethnically and linguistically diverse and intermixed, since there is evidence of Luwians contributing the sign 24 'house of the dead', a number of Luwian hieroglyphs and possibly the 7-metrical verse form of Stanza B, while it appears that the Etruscans' religious cult at the middle of the 2nd millennium BCE was written for the first time by a Greek-speaking priesthood, much as Latin was used by Christian Anglo-Saxon society in England to which a Celtic sub-stratum had contributed. Since there is clear evidence of horse breeding in the Troad throughout this period, was this an original Etruscan subsistence trait, or must it be attributed to Greek-speaking pastoralist immigrants as previously suggested (Bowden 1992), considering that the horse was probably not indigenous to Anatolia?

The essence of the problem is to explain economically the relationships of Phaistos disk complex metrics to those of Balkan agricultural fertility folk dances and Indian classical and religious dances; and, with alliteration, to verses of the Atharvaveda (Bowden 1992, Chapter 1 and Addendum). If all of these traits, plus the skull crest, were insignia of a human-sacrificial horse cult, then horse pastoralism could have come to the Troad with Achaeans through Thrace *circa* 1900 BCE, who subjected Tursha already there as inhabitants of Troy II, burnt about 2300 BCE, presumably by Luwians. There may have been an even earlier phase, *circa* 2800 BCE, of Luwians who had passed straight through the Caucasus with little linguistic change (Bowden 1992) into the Troad, Lycia and Crete. The culture in which the Phaistos disk was created probably had an Etrusco-Luwian equidominant or even female-dominant substrate dating from *circa* 2300 BCE or earlier, with superimposed on it (but largely absorbed after half a millennium) a Greek-speaking priesthood from the 20th century BCE reinforced by newly literate Mycenaean invaders in the 16th century BCE.

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The Titans and the Indo-European Primal Person

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Ouranos

During the academic year 1992/1993 Barry Powell gave a lecture at UCLA on his notions of 'Homer and the Origin of the Greek Alphabet.' One of his contentions was that Homer, at least as the actual oral poet who finally had his text transcribed, might have been a 'virtual contemporary' of Hesiod. While this might conceivably be true with regard to the transcription of the text, there is internal evidence that the mythical material if not the text itself may be more archaic than Hesiod's. Leaving aside possible linguistic evidence, where, for example, aspects of scansion may suggest that more archaic elements were still in play, I would like to speak about certain aspects of the mythic material.

Ouranos is treated differently by Homer and Hesiod. There is no unequivocal case where Ouranos was personified by Homer. The only instances which even imply that the name might refer to a distinct personification, are, firstly, its occurrence with Earth and other 'natural' phenomena like the river Styx in the formula of an oath (where Hera swears by Heaven and Earth, and the Styx etc.), and a single occurrence of the related term, in the plural, *οὐρανίωνες* in *Iliad* 5.898. In all other cases in Homer the term seems to refer to the 'heavenly ones', that is, the gods rather than specifically the Titans. But in this one case Zeus is angry with Ares, and tells him: 'for all the strife you've caused, if you weren't my son, you would have been lower than the *οὐρανίωνες* long ago.' A case can be made that this refers to the Titans in Tartaros, that is, the offspring of Ouranos, and so that Zeus was supposedly saying something like 'you would have been lower than the lowest ...' (*ἐνέρτερος οὐρανιώνων*) (*Iliad* 5.898). On the other hand, the passage may also be read simply 'you would have been lower than the heavenly ones' or as we might put it: 'if you weren't my son, you'd be a lot lower than a heavenly god today, boy.'

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In fact, neither γαῖα nor οὐρανός were especially personified by Homer. In *Iliad* 15.36 and *Odyssey* 5.184, Hera swears "by Earth and broad Heaven above along with the deep-flowing Water of the Styx." But such a formula does not require full or exclusive personification. And, in fact, the formula looks more primal, Hera is swearing, not by ordinary gods, but by the physical realities themselves: the underworld Waters, the Earth and the Sky.

There is one case in the *Odyssey*, however, which could presuppose a scheme more like Hesiod's, with Gaia herself being named as a mother:

> And I saw Tityos, son of glorious Gaia, lying on the ground. Over nine rods he stretched, and two vultures sat, one on either side, and tore his liver, plunging their beaks into his bowels, nor could he beat them off with his hands. For he had offered violence to Leto, the glorious wife of Zeus, as she went toward Pytho through Panopeus with its lovely lawns. (*Odyssey* 11.576-581;[1] cf. 7.324 which mentions Τιτυὸν Γαιήιον.)

We could argue that this passage is late; but that may not be necessary. The scheme in the epics may not have been as explicitly developed as that in the *Theogony*: effectively, underworld figures like Tethys and Okeanos were left vague and mysterious, earth and heaven (Ouranos) were usually not personified, and a certain mythical ambiguity or overlap may have been possible such that an equation of the φυσίζοος αἶα or γῆ (*Iliad* 3.243; 21.63; *Odyssey* 11.301) with Τηθύς (taken as 'Grandmother') would not be inconceivable (cf. *Iliad* 14.201ff.). But there is just not enough data in the epics to deduce a definitive cosmogonic scheme. The closest thing to a comprehensive cosmogony, and that implicit, occurs in *Iliad* 14, a book that is ripe with cosmogonic themes including, as a climax, an overt coupling of Zeus and Hera on mount Ida. And it is possible, if not likely, that the Homeric poets knew the Hesiodic scheme or something very like it (in the general sense) – simply presupposing that their audience knew it too. The contrary view, perhaps at best, can only assert that the earlier Homeric scheme may have been more 'primitive' than Hesiod's for instance. But we are discussing this

[1]Murray, trans. *Odyssey*, I: 426-427.

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possibility, a possibility which implies that the Homeric and earlier traditions might have known only a two-stage (Kronos-Zeus) succession, not the full-blown three stages of the *Theogony* (Ouranos-Kronos-Zeus).

The Earth in one form or another is also mentioned as having been involved in the growth of the giant 'twin' Aloadae (*Odyssey* 11.309), and again with respect to the twin Dioskouroi (11.301). In my dissertation on the primal phase of Indo-European cosmogonic myth I observed that her role as the mother of a nine-fold personage, or as the mother of twins, may be especially significant as well as typical.

I will pass over any questions of cosmogony proper, for now. And leaving aside the rich topic of the etymology of Ouranos, let us simply note that in any case it is an epithet or designation of heaven or the sky. But there is no case in the epics where 'ouraníōn' is definitely a patronymic. And Kronos is never refered to as 'uranian', which we might expect if Homer knew a scheme like Hesiod's.

In fact, in Homer's works, there is no direct contrast of Zeus and Ouranos: that is, the two never stand as juxtaposed personifications as they do in Hesiod, for example, where the one is clearly a grandson of the other, and on at least one occasion the grandfather gives advice to his grandson (*Theogony*, 891). This may be due to the general lack of personification for Ouranos, as I have suggested. But it may also be due to an older, perhaps more Indo-European, conception of Zeus, where Zeus is Father Heaven. While we cannot dismiss the possibility that the Homeric poets (or later redactors) simply presumed something like Hesiod's scheme, it is possible that the semantic conceptions of Ouranos and Zeus were not so distinct in earlier times.

Hesiod's Earth and Sky

Earth (Gaya) and Heaven (Ouranos) themselves are clearly personified by Hesiod. Near Eastern myth had already become so much a part of the Hellenic mind that the cosmogonic pattern of divine succession (involving, for instance, the castration of Heaven) was perhaps taken for granted by many. It is unlikely that it was simply imposed by Hesiod or his school. But Indo-European material may already have contained some notion of successive stages of cosmic development. The mythic sacrifice of a primal Twin or cosmic

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Giant could lend itself to comparison with myths of the castration or dismemberment of another primeval figure, and his replacement by another. Similar things could have been presupposed by Homer. Whatever the factual content of the epics, they do assume contact with the East, and especially with Asia Minor. On the other hand, the Homeric corpus does not explicitly mention a three-stage succession (Ouranos-Kronos-Zeus), or a castration motif. Only a two-stage replacement (Kronos-Zeus: Titans-Olympians) may have been assumed there. But this is an argument from silence, not proof. The influence of the East on Greek myth has been discussed at some length by various scholars.[2]

Professor Ivanov has suggested that Ouranos, as a personified designation for the sky, was developed as a specific translation of the Semiticized Sumerian *Anu* in the various creation stories of the Middle East.

Kronos

There is also something funny about the character of Kronos in the respective texts. Both Homer and Hesiod describe Kronos as

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[2]Puhvel devotes a whole chapter to the problem in his *Comparative Mythology*, Chapter 2, "Creation Myth in the Ancient Near East", pp. 21ff., cf. chapter 8 on "Ancient Greece", especially pp. 126-129; Burkert discusses the relation of the myths of Kronos and Kumarbi in his *Structure and History in Greek Mythology and Ritual*, Berkeley, 1979, pp. 20ff., deciding in favor of some sense of diffusion or influence from the East here, against G. S. Kirk who thought the myth of Ouranos and Kronos could be more of a parallel than a borrowing. Kirk writes:

> That some of the contents of the *Theogony* are of non-Greek origin and of a date far earlier than Hesiod's immediate predecessors is most strikingly shown by the parallelism between the Hesiodic account of the succession of oldest gods and the Hittite Kumarbi-tablet, of Hurrian origin and in its extant form dating from around the middle of the second millennium B.C. ... It should be noted that in Hesiod, also, the sky-god (with Gaia) helps the storm-god to survive. The Hittite version carries no implication that the emasculation of the sky-god was concerned with the separation of sky from earth; indeed, no earth-goddess is involved. This is an important difference, but it suggests, not that the Greek separation-motive had no 2nd-millennium archetype, but that the Greek version incorporates variants which do not happen to be found in the Hittite account. The Greek version was not derived specifically from the Hittite, of course: there was a widely diffused common account, with many local variants, of which the Hittite tablet gives one version and Hesiod another – a version, moreover, which had suffered the vicissitudes of transmission to a younger and very different culture (*Presocratic Philosophers*, pp. 36-37).

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'wily, clever, or devious' ἀγκυλομήτης (*Theogony*, 495); in fact this is a frequent epithet of Kronos in the epic (e.g., *Iliad* 2.205, 319; 4.59, 75; 9.37 etc.). But neither in the epics nor in the Hesiodic works is Kronos significantly involved in 'giving crooked or devious counsel' or being especially 'wily or devious.' In Hesiod his only big 'fault' is consuming his own offspring – and he seems to be pretty honest and forthright about that.

Interestingly, in the *Theogony* it is Ouranos (along with Earth) who on occasion gives devious counsel: to Rhea, for instance, against Kronos (470ff.), and to Zeus in regard to the offspring of Metis (891). And Hesiod not only calls Prometheus 'clever or devious,' he depicts him as actually doing at least something tricky (546ff.; cf. *Works*, 48).

The question is not why Prometheus might be called devious, but why Kronos would be considered especially devious. We may suppose that Kronos was supposed to have had a mythical character and career, of which we know only a few details. There were, for example, legends alluded to by several ancient authors which had Kronos involved in a battle with Ophiones, similar to that between Zeus and Typhon (this view was ascribed to Pherecydes and even Orpheus). We might imagine Kronos to have done something 'tricky' that we don't know about. But neither Hesiod nor Homer tells us much about his character. And neither tells us why he was considered to have been especially devious.

The name *Kronos* (rather than a patronymic or epithet derived from it) occurs far more times in the *Iliad* than in the *Odyssey*. Although there too it usually occurs in the expression 'son of Kronos' (refering to Zeus), it is only in the *Iliad* that mention of Kronos in his own right occurs. In 4.59 Hera says that 'crooked counseling' Kronos begot her as the eldest or at least elder (than Zeus), and as the most honored of his daughters, both by birth or seniority and by being the wife of the one who rules (ἀνάσσειν) among all the immortals. And Hera is several times referred to as the daughter of great Kronos (e.g., 5.721). Iapetos and Kronos form a pair in Tartaros: Ἴν' Ἰάπετὸς τε Κρόνος τε ἧμενοι (8.479-480). Zeus and Poseidon are called "the two mighty sons of Kronos" (13.345). And Poseidon says (of himself, Zeus and Hades) that we three are all sons of Kronos, born of Rhea (15.187). "The gods below with Kronos" are mentioned twice (14.274 & 15.225). And in 14.203, Hera recalled how Zeus

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thrust Kronos down beneath the earth and sea. Thus the myth of Kronos receives more overt emphasis in the *Iliad* than in the *Odyssey*.

In both epics the patronymic or adjectival Κρονίων 'son of Kronos' or 'Kronion' is a frequent epithet of Zeus. Even in the *Odyssey* Κρονίων is more frequent than Κρονίδης. But, perhaps significantly, it occurs six times in conjunction with the word ἄναξ 'protector, lord, king' (*Iliad* 1.502, 529; 2.102; 7.194, 200; 18.118).[3] Zeus is also invoked as 'protector or lord' with this term in prayer (3.351; 16.233; 17.354). The word ἄναξ is even more frequently joined with the name of Poseidon, almost as a doublet (in both epics, occurring at least ten times, plus once with the epithet Heliconian refering to Poseidon in *Iliad* 20.404). It is used of Hephaistos three times (note *Odyssey* 8.270 where it may emphasize his role as cuckholded husband of Aphrodite); and once of Hades as 'lord of the infernals' (*Iliad* 20.61: note that it is also said of Poseidon in this same story, 67). Apollo takes it frequently. Hermes (*Iliad* 2.104), Sleep (14.233), a river (*Odyssey* 5.445 & 450), Helios (12.176), and gods in general (12.290) are also on occasion called 'lord or ruler' by this term; and of course it is most frequent as applied to human heroes, chiefs and kings, including Teiresias in the underworld (*Odyssey* 11.144 & 151).

The term is the more noteworthy because it appears in Mycenaean inscriptions, and sometimes seems to be an independent designation for divinity.[4] If and when it thus refers to a divinity, the best possibility is that it refers to Poseidon.[5] The semantic parallel with the πόσις / πότνια root likely in the name of Poseidon, and designation for all those divine 'ladies' found on the Mycenaean tablets, implies a semantic or conceptual field involving kingship or rulership also in mythical contexts.

Most interesting for us may be the virtual collocation with Iapetos (8.479-480); this 'dvandva' is the only mention of Iapetos in

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[3]Puhvel's 1957 study of this term, "Greek ANAΞ" (in *Analecta*, pp. 6ff.), demonstrated that the term may have primarily been religious in sense, and only secondarily political, hence 'protector' or divine-lord rather than king as such originally. Thus in the Mycenaean texts where it clearly refers to the king, Puhvel has posited a somewhat sacral character for the specific office (*Analecta*, p. 25).

[4]Vermeule, *Greece*, p. 292; Chadwick, *Mycenaean World*, p. 97.

[5]Chadwick, *Mycenaean World*, p. 97, though he admits this with some caution.

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the epic. In Ulysses' vision of the underworld there were several sets of twins or sibling pairs: for example, the giant Aloadae (overtly sons of Poseidon by a mortal woman, yet the text implies that it was the nurturing Earth which made them grow so big) and the Dioskouroi. But we may also think of Minos and Rhadamanthys as a virtual collocation in classical times: "lords of the dead." Or we might think of that anthropomorphic stele from Kazanki, third millenium at least, with the pair of figures below its belt (Mallory *In Search*, p. 220; Anati *Le Statue-Stele*, #74), or of other stelae with paired objects or figures in their 'under the belt' register.[6] Achilles specifically sacrificed two out of nine dogs for Patroclos (*Iliad* 23.161ff.). Both the number nine and the number two may be significant with regard to the underworld. But this is another issue. The point is that Iapetos and Kronos are mentioned as a pair.

There is an alternate tradition regarding the role of Kronos in the netherworld. Some place him rather in the Elysian fields. In Hesiod's *Works and Days* it was said to be a golden age when he reigned on high (109ff.); but later, in describing the abode of the blessed (out on the islands along the perimeter of the deep-swirling Okeanos, and probably in the West), at least one version has:

> But to the others father Zeus the son of Cronos gave a living and an abode apart from men, and made them dwell at the ends of earth. And they live untouched by sorrow in the islands of the blessed along the shore of deep swirling Ocean, happy heroes for whom the grain-giving earth bears honey-sweet fruit flourishing thrice a year, far from the deathless gods, and Cronos rules over them; for the father of men and gods released him from his bonds. And these last equally have honor and glory. (*Works and Days*, 166-173: the version of Proclus which preserves the remark).[7]

The tradition which places Kronos in Elysium might conceivably be derived from sources which had Saturn there. The old Italic Saturn,

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[6]This paper was originally given at the Indo-European Conference at UCLA in May 1993. Karlene Jones Bley gave a paper and showed slides of her recent excavations in the Ukraine, including one of a Kurgan grave containing two dogs along with a horse in the burial.

[7]Evelyn-White, trans. *Hesiod*, p. 15.

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an ancient king who ends up as lord of the dead, suggests a possible type of Indo-European **Yemo*. But whether we place Kronos in Elysium or in Tartaros, the parallel to Yama may be valid. And the alternate Greek tradition may be an authentic variant of an older myth.

Legend had it that Kronos was worshipped as king of heaven in the oldest cult at Olympia (Pausanias 5.7.6). This of course may be an anachronism due to myths of divine succession like those in the *Theogony*.[8] Zeus and Kronos themselves were supposed to have been the first two to have wrestled at Olympia (Pausanias 5.7.10 & 8.2.2). Nearby, Mount Kronion was still sacred to Kronos:

> *Mount Kronion* runs along the line of the terrace and the treasuries [at Olympia], as I have already said. The peak of this mountain is where the Kings as they call them offer sacrifice to Kronos at the spring equinox, which falls in the Elean month of the deer. On the edge of Kronion, to the north of Altis between the mountains and the treasuries, is a sanctuary of Eileithuia in which the local Elean daemonic spirit called the city savior receives worship.[9] They call Eileithuia by the title Olympian and choose a priestess for the goddess every year. (Pausanias 6.20.1-2)[10]

It is interesting to find a shrine to the goddess of birth at the foot of a mountain sacred to Kronos. Levi tells us in the footnotes to his translation that while the summit is flat, there are no remains of an edifice there today. That does not preclude there having been rites there in antiquity. And the association of kingship or priests called kings is of course consistent with the myth of divine succession, but it is also consistent with the theme Güntert called the *Weltkönig*. While scholars today might no longer posit 'kingship' as such at the Indo-European stage, some sense of divine authority, rulership or protection is likely because of the reflexes in mythical rulers like

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[8]But Kronos and Rhea may still have had a joint altar there in the time of Pausanias (5.14.4). And at one time Kronos and Helios may have had an altar together (Wissowa, *Real-Encyclopëdie*, "Kronos"; cf. Pausanias 1.18.7; & 5.14.1ff.). Be that as it may, the joint altars at Olympia recall the *devata dvandvas* of Vedic religion.

[9]Perhaps the child Zeus, cf. Strabo 14.1.41.

[10]Levi, *Pausanias*, II p. 343.

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Thracian Salmoxis, Avestan Yima, Roman Remus and Irish Eber, not to mention the legend of the old Italic Saturn.

Pherecydes of Syros

Pherecydes of Syros was a mythographer and theogonist of the sixth century B.C.[11] Aristotle, for example, mentions him in the *Metaphysics* (N4.1091b8): "the 'mixed' theologians, those who do not say everything in a mythic way, such as Pherecydes and certain others, make the first source the *best* thing; the Magi also."[12] Diogenes Laertes wrote: "There is preserved of the man of Syros the book which he wrote which begins: 'Zas and Chronos always existed and Chthonie; but Chthonie came to be called Ge, since Zas gave her Ge as an honor (or prerogative)" (1.119).[13] This gift might have had something to do with the embroidered cloth he was supposed to have given her at their wedding. Pherecydes was something of a legenday figure like Pythagoras with whom he was sometimes associated, some maintaining that Pythagoras was his pupil; it was also suggested that he was familiar with secret books of the Phoenicians.[14]

It is difficult to establish a clear scheme in Pherecydes' thought, because the material is recounted in fragments, and in observations by later writers. But there may have been older, or alternative, mythical elements preserved in his version of cosmogony. This, in summary, seems to have been: Kronos and Zeus (at least in their primal forms) stood rather like twins or brothers in a scheme involving a primal Earth.

There is no apparent mention of Kronos, even in the form of the patronymic 'son of Kronos', in Mycenaean texts.[15] One might argue that Kronos would not have a living cult, and that therefore the name would not be likely to show up in the records of things given and done for gods. Kronos as he comes off in Hesiod's account, or in Homer's, is a more or less otiose figure. However, we might like to

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[11]Kirk & Raven, *Presocratic*, pp. 48f.

[12]*Presocratic*, #42, p. 48.

[13]*Presocratic*, #43, p. 49; & #50, pp. 54f.

[14]*Presocratic*, p. 52; see #47, Suda reflecting on Pherecydes.

[15]There is a slight (and unlikely) possibility that Kronos might have been depicted on a certain vase: *qe-ra-na a-mo-te-wi-ja ko-ro-no-we-sa*, on tablet Ta 711 from Pylos (*Documents*, 335; Palmer, *Mycenaean Tomb Inventory*, 12.73): but a vase with a κλόνος 'battle-scene' may be more likely than one with a Kronos.

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look at Pherecydes' Chronos-Kronos as a possible echo of the pre-Hesiodic figure. In other words, Pherecydes may support the position that the Homeric corpus knew only a two-stage succession, if we can allow his patently pseudo-archaisms to say something about ancient myth.

Atlas etc.

We may not know much about Iapetus, but there was a great deal of myth about his sons. If we were looking for a reflex of the Indo-European figure which shows up as the Norse Ymir and the Vedic Puruṣa, the most likely candidate in the Greek material would seem to be Atlas.

> But my heart is torn for wise Odysseus, hapless man, who far from his friends has long been suffering woes in a sea-girt isle, where is the navel of the sea. 'Tis a wooded isle, and therein dwells a goddess, daughter of Atlas of baneful mind, who knows the depths of every sea (*θαλάσσης πάσης βένθεια*), and himself holds the tall pillars which keep earth and heaven apart (*αἳ γαῖάν τε καὶ οὐρανὸν ἀμφὶς ἔχουσιν*) (*Odyssey* 1.48-54).[16]

Both this reference in the *Odyssey* and that given in Hesiod's discourse on the underworld imply that Atlas has an aspect below sea-level (*Theogony*, 736-757). The implication of Homeric *ἀμφὶς ἔχουσιν* may be somewhat ambiguous: does he keep them apart, or does he hold them both? The descriptions of ancient works of art by Pausanias seldom have Atlas holding up the sky alone (which is how he might appear he if were depicted standing on the earth, and supporting the sky); he "holds up earth and heaven" (5.11.5; 5.18.4), and he "holds up the universe" (6.19.8) with Herakles and an apple-tree nearby. The passages in both Homer and Hesiod seem to agree that Atlas has a function with regard to both earth and heaven. Regardless of how he comes to be depicted in later art, the oldest mythical texts imply he may be a reflex of a cosmic person. In an illustration on a sacred chest in Eleia:

> Atlas holds up heaven and earth on his shoulders as the legend

[16]Murray I pp. 6f.

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> says, and carries the apples of the Hesperides. Nothing is individually inscribed on the man holding the sword and coming to Atlas to say who he is, but it is completely obvious that this is Herakles; the general inscription is: 'Look, Atlas holds heaven and will drop the apples.' (Pausanias 5.18.4)[17]

This picture is very interesting: here is a kind of cosmic giant, and a man with a sword (implicitly a son of Zeus) is approaching him. Of course the overt reference is to one of the labors of Herakles. This is clear since Herakles is also depicted in each of the three cases mentioned. But there may be a level at which the labor of Herakles itself may echo more primordial affairs. The story here is overtly bloodless, Atlas is tricked rather than sacrificed. But the imagery reeks of old cosmological symbolism: here is a giant involved with both earth and sky, also somehow associated with a tree, and connected with a group of women.[18]

In the *Theogony* Atlas is the son of Iapetos and Clymene, a daughter of Okeanos and Tethys (351). Clymene is listed along with such noteables as Styx, Urania, Metis, Asia, and also Calypso as sisters (363). Some versions had Asia as his mother (Apollodorus 1.2.3). Hyginus (*Fab.*, preface) had Gaia and Aether as his parents. This, however, may just be a late way of saying earth and sky themselves. Plato records a strange legend with regard to Atlantis: this posits Poseidon as the father of Atlas who is born as a twin.[19]

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[17]Levi II, p. 252.

[18]While the Baltic tale of the Maid of the Sea (recounted by Greimas, *Des dieux*, pp. 79-83) had its orchard in the possession of the grand-mother of the Winds, and three antagonistic giants to be slain in protecting it, the imagery and the themes may still bear comparison.

[19] And Poseidon himself set in order with ease, as a god would, the central island, bringing up from beneath the earth two springs of waters, the one flowing warm from its source, the other cold, and producing out of the earth all kinds of food in plenty. And he begat five pairs of twin sons and reared them up; and when he had divided all the island of Atlantis into ten portions, he assigned to the first-born of the eldest sons his mother's dwelling and the allotment surrounding it, which was the largest and best; and him he appointed to be king over the rest, and the others to be rulers, granting to each the rule over many men and a large tract of country. And to all of them he gave names, giving to him that was eldest and king the name after which the whole island was called and the sea spoken of as the Atlantic, because the first king who then reigned had the name of Atlas. And the name of his younger twin-brother (*τῳ δὲ διδύμῳ μετ' ἐκεῖνόν τε γενομένῳ*), who had for his portion the extremity of the island

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One of the other brothers was named Autochthon; and the mother was a certain Cleito, the daughter of Evenor and his wife Leucippe. They however were sprung from the earth itself (*τῶν ἐκεῖ κατὰ ἀρχὰς ἐκ γῆς ἀνδρῶν γεγονότων*) (113c-d). Now although Plato writes that Poseidon took for his allotment (among the gods) the island of Atlantis (113b-c), I think we may have reflexes of mythical cosmogony here. The story here is not particularly Egyptian in character, and if, as Plato thought, it came from Egypt through Solon – Solon's translation (113a-b) thoroughly couched it in terms of Greek mythology. This story too may remind us of the tale of the Second Sun or Maid of the Sea in Baltic myth;[20] at least the basic themes may look similar.

What we have here from Plato, in fact, may have reflected an ancient cosmogony: Poseidon as consort of the earth generated twins, Atlas was the eldest and ruler. The issue was not simply an island, but the formation of land in general.

There is a parallel to this tale perhaps in the myth of the island of Rhodes. According to Pindar (*Olymp.* 7.54-73), when the gods divided up the cosmos, the Sun (Helios) did not get a share; but Rhodes was still hidden beneath the sea; when it fortuitously rose up, the Sun took this 'Rose' for his own, and she bore him seven sons. The idea of generation from below, here explicitly in water, may also be reflected in the ancestry of the personified figure. Rhode (Rhodes) was the sister of Triton, and they were the children of Poseidon and Amphitrite (again those hints at the ambivalent or the ambidexterous). Amphitrite is mentioned in the *Odyssey* (3.91; 5.422; & 12.60, 97) where she is respectively involved with the waves of the sea, breeding sea-monsters, and producing a variety of marine denizens; here her name is no doubt a term for the sea itself. According to the *Theogony* (243) she was a daughter of Nereus and Doris (Doris was a daughter of Okeanos and Tethys, 241-242 & 350, but interestingly one of her daughters, Amphitrite's sister, is also named Doris, 250). According to Apollodorus (1.4.5), she was a

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near the pillars of Heracles up to the part of the country now called Gadeira after the name of that region, was Eumelus in Greek, but in the native tongue Gadeirus, which fact may have given its title to the country (*Critias*, 113d-114b) (Bury, *Plato, Timaeus, Critias*, pp. 280-283).

[20]In Greimas, *Des dieux – Apie dievus*.

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daughter of Okeanos, and by Poseidon "bore a son Triton and a daughter Rhode whom the Sun married." The Homeric Hymn (III) *to Delian Apollo* listed the loud-mouthed Amphitrite along with Dione, Rhea, Ichmaea and Themis, as one of the principal goddesses who assisted at the birth of Apollo (with Hera keeping Eileithyia away, just to make things difficult, 92-97). The *Theogony* describes Triton: "And of Amphitrite and the loud-roaring Earth-Shaker was born great, wide-ruling [*εὐρυβίης*, reminiscent of Eurybia the daughter of Earth and Sea, 239] Triton, and he owns the depths of the sea, living with his dear mother and the lord (*ἄναξ*) his father in their golden house, an aweful god" (930-933, following on the heels of Athena's birth).[21]

Other Titans

The confusion over the parentage of the Hyades – either Atlas and Pleione, or Okeanos and Tethys – again hints at the primal nature of the things connected with Atlas. The confusion over Atlas's parentage – either Iapetos and Clymene (or her sister Asia), or Poseidon and Cleito – may hint at Poseidon's role, in some mythical contexts, as a primal figure rather like Kronos (we will return to this point below). But Atlas was only the foremost and perhaps eldest of the offspring of Iapetos.

> Now Iapetus took to wife the neat-ankled maid Clymene, daughter of Ocean, and went up with her into one bed. And she bare him a stout-hearted son, Atlas: also she bare very glorious Menoetius and clever Prometheus, full of various wiles, and scatter-brained Epimetheus who from the first was a mischief to men who eat bread; for it was he who first took of Zeus the woman, the maiden whom he had formed. But Menoetius was outrageous, and far-seeing Zeus struck him with a lurid thunderbolt and sent him down to Erebus because of his mad presumption and exceeding pride. And Atlas through hard constraint upholds the wide heaven (*οὐρανὸν εὐρύν*) with unwearying head and arms, standing at the borders of the earth before the clear-voiced Hesperides (*ἔχει κρατερῆς ὑπ' ἀνάγκης πείρασιν ἐν γαίης, πρόπαρ Ἑσπερίδων λιγυφώνων,*

[21]Evelyn-White's translation, pp148f.

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> ἐστηὼς κεφαλῇ τε καὶ ἀκαμάτῃσι χέρεσσιν); for this lot wise Zeus assigned to him. And ready-witted Prometheus he bound with inextricable bonds, cruel chains, and drove a shaft through his middle, and set on him a long-winged eagle, which used to eat his immortal liver; but by night the liver grew as much again everyway as the long-winged bird devoured in the whole day. That bird Herakles.... (*Theogony*, 507-526)[22]

If we took the sons of Iapetos and put them together, we would have a cosmic character. In the scene which Hesiod provides, the head and hands of Atlas are mentioned, and the midsection of Prometheus, while Menoetius lies completely below. I have suggested that the visceral punishment of Prometheus, or that of the parallel earth-born Tityos, may reflect Indo-European sacrificial technique (or an idealized mythical version).

Prometheus's mythical connection with sacrifice is explicit: he was involved not only with mankind gaining the use of fire, but with the beginnings of sacrifice. In *Works and Days* we read how he was supposed to have hidden fire inside a hollow fennel-stalk (ἐν κοίλῳ νάρθηκι λαθών, line 52; also *Theogony*, 567). (That 'mysterious reed standing up in the waters' in Indian myth, and that fiery reed which generated the Armenian hero Vahagn, come to mind as possible parallels.) But his other great trick is likely an etiological tale to explain certain aspects of Greek sacrificial ritual: he dressed up (arranged) the bones with some fat for Zeus. In *Gylfaginning* 44 we can read how the bones were sacred to Thor. The Middle Eastern theory of sacrifice, more involved with temple cults and idol-latria, regarded the sacrifice more as a meal served to the gods; whereas the Indo-European notion was more of a celebration which the gods attended, a feast in which they participated, but not one which they ate exclusively.[23] Prometheus has been made the mythical scapegoat for the likely Indo-European custom of laying out the bones, and

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[22]Evelyn-White, pp. 116f.

[23]Paul Thieme, quoted/translated by Mallory, *In Search*, p. 128:

> The oldest religious rites of Indo-European peoples do not presuppose temples or idols. Nor is there a reconstructible term for 'temple.' But there is a 'worship', conceived as a hospitable reception with a meal, consisting of slaughtered animals, and accompanying recitation of poetry, the 'celestials' coming, as it were, on a visit to the 'earthly ones'.

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offering the gods the flash of things like the omentum. But the important thing for us here is that Prometheus both in regard to fire and in regard to ritual practices may be connected to achetypal sacrifices (*Theogony*, 535-560, note 556-557 declaring the custom dealing with the bones to be a result of this 'trick'). Prometheus was also sometimes associated with the ancestry of mankind, the *Scholiast on Apollonius Rhodius* (*Arg.* 3.1086) describing Hesiod's *Catalogues of Women* wrote that Deucalion was the son of Prometheus and Pronoea.[24] And in the *Theogony*, he is called 'kindly' with regard to mankind (613-616).

Hesiod calls Prometheus 'wily, clever, or devious' ἀγκυλομήτης (e.g., *Works*, 48; *Theogony*, 546); the same adjective applied to Kronos (*Theogony*, 495). The co-incidence here may be more than accidental.

The point here is that Iapetos and his sons form more than a complement to Kronos; they may form a parallel. Kronos and the sons of Iapetos taken together as a collage would make a picture remarkably similar to what has been posited for the Indo-European Twin-man. The only mention of Iapetos in the epic was that possible dvandva with Kronos (*Iliad* 8.479).[25]

And as we observed, in the *Theogony* it was Ouranos (along with Earth) who on occasion gave devious counsel. This may be another bit of evidence to support the case that the Homeric scheme knew a two-stage succession in contrast to the Hesiodic three. Thus the devious role of Kronos or of the more archaic figure he represented perhaps came to be meted out to Prometheus in one context, and to the personified Ouranos in another.

One could say that there may be no clear Greek reflex of the Indo-European figure which turns out as Ymir and Yama. But if we look at the whole Titanic complex, there may have been a similar function. The Greek penchant for not simply syncretizing but for multiplying figures is operant here. If we put Kronos, Iapetos, Tityos,

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[24]Evelyn-White, *Hesiod*, pp.154f.

[25]Christian lore even equated Iapetos with the biblical Japhet, one of the three sons of Noah, and the father of the northern peoples in general. This connection may be purely accidental, like a kind of weird pun, but even so looks very suggestive. And, in fact, since we know that there may be Middle Eastern influences and reflexes in Greek myth, it is not altogether impossible that the Greek Iapetos and the biblical Japhet do represent the same mythical figure originally.

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Altas, and Prometheus together, they would constitute a type like Ymir, and also a type like Yama (i.e., a Lord of the Dead). We might posit that the original character of Kronos (or whatever mythical prototype lies behind him) may have come to be divided up and portioned out, with the personified Ouranos assuming part of it, and the sons of Iapetos other aspects.[26]

Tityos etc.

Tityos may or may not have been the same mythical figure as Prometheus originally, but his lying stretched out over a nine-fold measure may at least suggest cosmographic themes.[27] Greek myth contains a slew of Titans and earth-born monstrosities: hideous cyclopes, and figures like Briareos, besides 'crafty' characters like Prometheus and Kronos. What did the Homeric poet mean when he sang of Iapetos and Kronos in Hades? We cannot issue a dogmatic conclusion. But through comparison with other figures like the two sons of Iphimedeia, we are faced with the tantalizing possibility that Indo-European primal giants, if not the Big Boy himself, might be reflected here, at least distantly. The notion of twins or a double-figure may have persisted sufficiently that the poet felt a collocation was called for (just as in later contexts Achilles and Patroclus, or

[26]To some extent psychological explanations of Greek myths may be valid. The ancients did not have a separate science of psychology. Myth can not only speak of themes of Nature, but of themes and aspects of human life and mind. Zeus, in a way, may figure the fullness of consciousness. However useful Forethought (Prometheus) may be, it too must be restrained sometimes; one cannot always afford to wait and plan before taking action. Of course excessive Regret or After-thought (Epimetheus) is often useless; and so is excessive Nervousness or Desire (Menoetius). Sometimes such drives must be subdued, put down or left to the unconscious (Hades). I get the impression that the ancients themselves were already engaged in symbolic psychology with such mythical figures. In the case of the sons of Iapetos, these implications were explicit in their names. This also means that a certain amount of thought or interpretation was being applied by the poets themselves (Hesiod or his school for example). Reflexes of older myth may become more clouded, even as they are given new meaning and symbolism. Like the clever Norse Loki who had his connections with the giants and the underworld, the intellectual sons of Iapetos, and the crafty Kronos, had their connection with the giants and their fate below.

[27]As discussed at greater length in my dissertation, the importance of the number nine, or the multiple of three, and of three itself in Indo-European mythical cosmography keeps asserting itself in the ancient texts themselves.

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Minos and Rhadamanthys would function as pairs even in the netherworld).

'Titan'

The etymology of τιτάν is not absolutely certain, but a good possibility relates the term to the reduplicated verb τιταίνω 'to stretch, or exert oneself.' This would make Titans in general the ones who opened up the world, separated earth and sky, spread things out, and so forth. (We might compare Ṛg Veda 10.129.5, where the dividing line first extends across, and after that things start to develop vertically.)[28] Hesiod himself relates this etymology, saying that Ouranos called them Titans because they were 'straining or struggling' τιταίνοντας so much (*Theogony*, 207-210).

Epimenides, perhaps combining Greek and pre-Greek notions, supposedly held a scheme where natural phenomena themselves (Air and Night, with Tartaros) generated "two Titans"; they in turn gave birth to the egg from which the world was formed.[29] Since the egg smells a little like 'Old European' symbolism, we cannot say Epimenides was simply proposing a version of an Indo-European myth; but the notion of a pair of Titans is itself an interesting theme (compare the twain Vedic *rodasī* or besides the male-female Heaven-Earth kind, the collocations like Iapetos and Kronos, or even Kronos and Zeus in the lore of old Olympia). One way or the other, a 'pair of Titans' could be a reflex of Indo-European myth.

Poseidon

We may find no mention of Kronos in the Mycenaean texts. But if we were to examine some of the mythical repertoire of the great 'lord' Poseidon, we might find him originally to have been a much more ambiguous figure than comes across in classical myth.

Poseidon, like Zeus, was reputed to have had a hippomorphic affair with Demeter; giving rise to a horse *Areion* and a 'Mistress'

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[28]In my dissertation I discuss Yima's enlarging of the threefold world, Visnu's three steps, the Norse Vidar's keeping open the jaws of the beast, and other mythical notions which have to do with the expansion of space, or opening, stretching, or extending things out. This may have been an important Indo-European cosmogonic theme.

[29]According to Damascius *de principiis* 124 (Diels' 3b5); Kirk & Raven, #40 p. 44; probably taken from Eudemus.

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(whose cult was prominent in Arcadia). And Pausanias also records the legend that at Poseidon's birth Rhea did almost the same thing with him she would do with Zeus: she hid Poseidon among some sheep, and gave Kronos a pony to eat instead (8.8.2).

If the role of the Mycenaean Poseidon was not as precisely distinguished from that of his counterparts Zeus and Hades, as it would be in the epics or in the later mythology, perhaps Poseidon was originally more of a chthonic figure than he appears in classical mythology; and like the Baltic *Žemininkas* or *Žemėpatis* may have had more of a connection with the underworld and the dead. His standard epithet as 'Earth-shaker' implies his close involvement with the ground in some sense. In *Iliad* 20.61-66 the 'king' of the underworld, Hades, cries out lest 'king' Poseidon (67) split open the earth and expose his realm: "that dread and dank abode which even the gods despise" (65; notice the similarity to the expression found repeated in Hesiod's discourse on the Underworld, in *Theogony* 739 & 810). We have already observed that in Arcadian myth Poseidon was a consort of Demeter. On one of the richest tablets from Pylos (Tn 316)[30] a double feminine offering was made at the shrine of Poseidon (or his consort); this also implies that Poseidon in some way may have been involved with Demeter and Persephone (or another 'Mistress' paired with Demeter). Poseidon was associated with sacred rulership: but so was Kronos.

In *Odyssey* 1.386, Antinous, observing the increasing boldness and maturity of Telemachus, makes the possibly light-hearted prayer: "May the great Kronion never make thee king in sea-girt Ithaca, though by birth it is thy right to inherit from thy father." It may be significant that Zeus is invoked under the designation 'Kronion' precisely in regard to kingship. In the time of Pausanias, Kronos was still associated with 'kingship' on Mt. Kronion (6.20.1); and there were legends that Kronos and Zeus themselves had wrestled for the kingship at Olympia (positing the titanomachy as the origin of the Olympic games, Zeus' Kouretes running the first race) (5.7.10; & 8.2.2). At one temple of 'Zeus the King' there were significant statues of Kronos, Hera and Zeus (9.39.3). And connected with a temple of Olympian Zeus lay an old temple of Kronos and Rhea,

[30]Ventris & Chadwick, #172.

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which was also associated both with Zeus and with "Olympian" Earth (1.18.7). And as we have already seen Kronos may have involved a richer mythical complex in earlier times.

Kronos himself, for instance, was usually considered to be the father of the archetypal centaur Cheiron[31] who personally instructed Asclepius,[32] Jason,[33] Peleus[34] and Achilles (*Iliad* 11.832; 4.219; 16.143; & 19.390). The last two citations mention that Cheiron had fashioned a spear of ash which he gave to Achilles' father Peleus on the peak of Pelion. It is interesting that Pelion was one of those mountains involved with the Aloadae and the Muses. The forests on Mount Pelion were Cheiron's legendary haunt.

> The author of the *War of the Giants* says that Cronos took the shape of a horse and lay with Philyra, the daughter of Ocean. Through this cause Cheiron was born a centaur: his wife was Chariclo. (*Scholiast on Apollonius Rhodius* 1.554)[35]

If Kronos in the birth of Cheiron parallels Poseidon in the birth of Areion (plus the Mistress in some versions), the di-morphic Cheiron represents Kronos much as the two giant sons of Iphimedeia, or the horse and the Mistress, express Poseidon. It may be relevant that the pedicle of the Roman temple of Saturn was ornamented with tritons. The classical son of Poseidon, Triton is also a di-morphic figure, albeit aquatic below.

There is a good possibility, then, that aspects of the Indo-European Twin-man, even in his role as king of the dead, might lurk beneath the Mycenaean Poseidon to some extent. In Homer's and Hesiod's account Poseidon is the elder brother of Zeus. Homer even

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[31]Apollodorus 1.2.4; Cheiron even takes the epithet Κρονίδης (Poet. *de herb.* 115; Orph. L. 11); and there is a word in Aristophanes' *Nubes* (1070) κρὀνιππον which Hesychius glossed παλαιον- but an 'old horse' with this etymology could at least be an allusion to Cheiron.

[32]Grant & Hazel list Jason, Asclepius, Asclepius' sons Machaon and Podalirius, Actaeon, and Achilles as his pupils; *Gods* "Chiron", p. 89.

[33]*Scholiast on Homer, Odyssey* 12.69; Eveyln-White pp. 162-163; cf. *Theogony* 1000-1002.

[34]According to the Hesiodic *Catalogues of Women*; Evelyn-White pp. 198-199 (see note p. 193; text from Berlin Papyrus 10560); cf. *Scholiast on Iliad* 17.140; Evelyn-White pp. 496-497.

[35]Evelyn-White, pp. 482-483: from the Titanomachy? cf. *Theogony*, 1001-1002; Apollodorus 1.2.4.

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recounts at least one instance when the two of them were at war: specifically Hera, Poseidon and Athena conspired to dethrone Zeus (*Iliad* 1.399-405) who is expressly referred to as the Kronion (405). This both echos and parallels the case of Kronos: and observe that in this case also it is the elder male who loses.

Poseidon was connected with Mount Helicon (*Iliad* 20.404) the primary mountain of the Muses; and his sons Ōtos and Ephialtes, the Aloadae, were also associated with the Muses. Perhaps like Zeus in the birth of Athena, Poseidon also assumed aspects of an older Kronos / Primal-Person myth.

Dual Celestials?

The usual pattern of Indo-European divine 'authority'[36] may have called for one or two celestial sovereigns. The former case would seem to have been naturally balanced by a counterpart (for example Heaven with Earth, or the Greek Zeus distinguished from his brother Poseidon or Hades, or else from his father Kronos). But even in the latter case, one of the pair may be intrinsically more involved than the other with the night, the underworld and the dead – hence Varuṇa, Odin, Velinas, and that type of figure, as has been suggested.[37] This could reflect or repeat, or at least parallel or echo, the pattern in cosmogony. In this respect, Kronos and Zeus form a complementary pair; but in other contexts, so do Poseidon and Zeus, and Hades and Zeus (that is Zeus katachthonios and Zeus ouranios). Perhaps the picture the ancients got from Pherecydes was not, originally, as untraditional or innovative as it might seem in classical mythology.

Conclusion

Certainly, at the classical Greek stage, we cannot simply reduce these figures – Ouranos, Kronos, Iapetos and his sons, let alone Hades or even the archaic Poseidon – to say they were all simply

[36]'Kingship' is an admittedly loose term; Jaan Puhvel (personal communication) cautions that even in quotation marks 'kingship' may not be the most accurate term to talk about notions of authority or divine sovereignty at the common, not to mention the proto-, Indo-European level.

[37]As Kuiper and even Lüders to some extent do with Varuṇa, and Puhvel and others with Odin; and as may be patently inherent in the mythic character as well as the name of Velinas.

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reflexes of the same Indo-European figure. But a good case may be made that aspects of the Indo-European cosmology and mythical figure which shows up in the Norse Ymir and the Vedic Yama may be reflected generally in things Titanic, and remotely in archaic aspects of Poseidon.

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Severed Heads Under Conall's Knee
(*Scéla Mucce Meic Dathó*)

William Sayers
Silver Spring, Maryland

The revised version of J. E. Caerwyn Williams' *Traddodiad Llenyddol Iwerddon* that appeared in 1992 with the collaboration of Patrick K. Ford under the title *The Irish Literary Tradition* includes in its opening chapter, 'The Beginnings', Conall Cernach's well-known boast from *Scéla Mucce Meic Dathó*, intended, no doubt, as an exemplary statement of the aggressive heroic ethos that informed the tales of the Ulster cycle:

> 'I swear ... that which my people swear, that from the time I took spear in hand, I have not failed to kill one of the men of Connacht every single day, nor to destroy by fire every single night, and that I have never slept without the head of a Connacht man under my knee.'[1]

The original, to which generations of beginning students of Old Irish have been exposed through Chadwick's reader, Thurneysen's edition, and Lehmann and Lehmann's primer, runs as follows:

> 'Tongu na·tongat mo thuath, ō ro·gabus gaī im láim nad·raba cen guin duini do Chonnachtaib cach ōenlaithi ocus orcain fri daigid cech n-ōenaidchi, ocus niro·chotlus riam cen chenn Connachtaig fom glūin.'[2]

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[1]J. E. Caerwyn Williams, *Traddodiad llenyddol Iwerddon* (Cardiff: University of Wales Press, 1958); J. E. Caerwyn Williams and Patrick K. Ford, *The Irish Literary Tradition* (Cardiff, University of Wales Press, and Belmont, Mass.: Ford & Bailie, 1992), p. 13.
[2]*Scéla Mucce Meic Dathó*, ed. Rudolf Thurneysen, Mediaeval and Modern Irish Series [= MMIS] 6 (Dublin: Dublin Institute of Advanced Studies [= DIAS], 1935), par. 16; N. Kershaw Chadwick, *An Early Irish Reader* (Cambridge, 1927); R. P. M Lehmann and W. P. Lehmann, *An Introduction to Old Irish* (New York: Modern Language Association of America, 1975). Concurrence in this interpretation in 'The Tale of Mac Dathó's Pig' in *Early Irish Myths and Sagas*, trans. Jeffrey Gantz (Harmondsworth: Penguin, 1981), p. 186.

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While the familiar oath formula has been the object of recent scrutiny,[3] the capsule account of Conall's activity on the Ulster-Connacht border and his typical night's rest has gone without comment. Even with allowance for epic inflation, modern readers seem invited to assume that supposedly realistic military field conditions and conventions are being described and, to put it more pointedly, that the enemies' severed heads and Conall's overlying knee belong to the same category of real human body parts. This note calls that assumption into question. It should be emphasized at the outset that the initial objective is not to recover historically accurate ethnographical detail about early Irish culture, but rather to chart possibly successive meanings given to this description in the world of story by reciters, editor/scribes, and readers/listeners.

Táin Bó Cúailnge gives some impression of the camp life of a large host, although many actual forays or preys must have been of shorter duration, for instance, overnight raids, involving smaller numbers and local opponents.[4] The encampment (*dúnad*) consisted in part of tents (*pupall* < Lat. *papilio*) and early in the story Ailill's is described (ll. 140ff.). Beds and blankets (*coilcthe 7 brothracha*) were provided on one side of Ailill for four of the most prominent warriors (including Conall Cernach, here with Fergus among the exiled Ulstermen)[5] and on the other side for Medb and two girls; the

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Conall's oath is found in the larger context of his flyting match with Cet mac Mágach. For a study of such stylized verbal abuse with a valuable cross-cultural introduction, see Ward Parks, *Verbal Duelling in Heroic Narrative: Homeric and Old English Traditions* (Princeton: Princeton University Press, 1990).

[3]Ruairí Ó hUiginn, '*Tongu do dia toinges mo thuath* and Related Expressions', in *Sages, Saints and Storytellers: Celtic Studies in Honour of Professor James Carney*, eds Donnchadh Ó Corráin, Liam Breatnach and Kim McCone (Maynooth: An Sagart, 1989), pp. 332-41.

[4]*Táin Bó Cúailnge: Recension I*, ed. and trans. Cecile O'Rahilly (Dublin: DIAS, 1976); references are to this recension and edition unless otherwise noted.

[5]The question of Conall Cernach's whereabouts during the *Táin* and his general role as a saviour or reliever figure are considered in *Táin Bó Froích: Die Romanze von Fróech and Findabair*, ed. and trans. Wolfgang Meid (Innsbruck: Innsbrucker Gesellschaft zur Pflege der Geisteswissenschaften, 1970), pp. 207f. A biographical sketch is given by J. P. Mallory in 'The Career of Conall Cernach,' *Emania* 6 (1989), 22-28. A text which is in the nature of a compendium of principal information on Conchobar and his warriors is *Scéla Chonchobuir*; it represents a relatively late stage in the tradition. Still attached to Conall is the tag (excerpted from the oath): *& nar chotail riam cen chend Connachtaig foa glún* (he never slept without the head of a Connachtman beneath his knee); in *The Book of Leinster* [= *LL*], eds R. I. Best and M. A. O'Brien, Vol. 2 (Dublin: DIAS, 1956), ll. 12,525f.

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tent also had room for servants and attendants. This arrangement seems to replicate that of the royal hall with its scrupulous attention to rank and seat. Fergus mac Róig had a tent of his own as did other chieftains, and these too housed more than a single person. Less eminent members of the host appear to have had more modest accommodation in shelters (*sosta*) that were thatched at each new site (l 151); perhaps some light wooden framework was transported and erected. The larger tents could also house the social activities of the hall, such as the chess match between Fergus and Ailill. The same tent also receives Fer Báeth, other warriors, and eventually Fer Diad, Cú Chulainn's foster-brother; they are entertained and plied with wine by Medb, who tries to induce them into facing Cú Chulainn.

Individual warriors could also take temporary shelter beside their war-carts (e.g., Fer Diad, ll. 2898ff.). The tie-poles (*fertsi*) that attached the body to the axle-tree could be withdrawn so that the spoked wheels were not distorted by weight when the cart was not in use. These along with the rugs and skin coverings of the cart (*fortcha 7 forgemen*) could be arranged as a lean-to or litter at the side of the vehicle. Cú Chulainn, however, keeps a sleepless vigil on the Ulster border, except on those rare occasions when he is ministered to by his wife or another woman in more congenial surroundings, or is taken by Lug to the *síd* for a restorative sleep.

When the call to battle comes, warriors rush naked through the walls of their tents (ll. 3937). Even in the more comfortable surroundings of their own fortified houses, heroes are pictured as leaping from bed at the sound of tumult and dashing naked outside. *Táin Bó Regamna* opens with the following scene:

> A mboí Cú Chulainn i nDún Imrid co cúalae ní a ngéim. Co ndíuchrastar triana chotlud conid corastar assa imdai co riacht in n-aridin ina ṡuidiu for lár. Íar sin immach do ṡuidiu ar les.

The most recent editor, Johan Corthals, translates:

> Als sich Cú Chulainn in Dún Imrid befand, hörte er eine Kuh brüllen. Er erwachte aus dem Schlaf, sprang aus dem Bett und

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> landete sitzend mitten auf der Bank. Dann stürzte er hinaus auf den Hof.[6]

The editor's note, however, makes it clear that some license has been taken in the translation of *imdai, aridin* and *lár*. These are terms frequently employed in descriptions of more spacious royal halls such as the succession of legendary structures erected on the Hill of Tara. According to early Irish tradition, the king's hall was oriented on an east-west axis.[7] Along the north and south walls were series of semi-enclosed compartments (*imdae*, earlier *immid* < *imbith* 'being within'),[8] mounted on relatively high daises (*ailad, taulach*). They contained couches for eating and sleeping, and some may have had pillars rising toward the roof. On the sides were partitions over which diners could view others in the hall. At the front of the compartment facing the hall were one or more steps called *ordd*. Derivation from Latin *ordo* 'order, rank' seems straightforward, although I would not exclude the possibility of a metaphorical term originating in *orddu* 'portion, joint', especially in its sense 'articulation', which subsequently, in this context of hierarchy, aligned itself with the ecclesiatical loan from Latin. Between the two rows of *imdae* and at the foot of the *ordd* ran similar rows of lower daises or

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[6]*Táin Bó Regamna*, ed. and trans. Johan Corthals (Vienna: Die Österreichische Akademie der Wissenschaften, 1987), pp. 29, 36f., citation from 'Lesetext', p. 51.

[7]The following draws on the review in William Sayers, 'A Cut Above: Ration and Station in an Irish King's Hall', *Food and Foodways* 4 (1990), 89-110. Other relevant studies, where it is not always possible to reconcile the archaeological evidence with the literary, are: F. Shaw, 'Literary Evidence for the Early Irish House', *Archaeological Newsletter* 4 (1952), 73; Françoise Le Roux, 'Notes d'histoire des religions XV, No. 43: La maison du roi', *Ogam* 18 (1966), 510-11; J. R. Hamilton, 'Iron Age Forts and Epic Literature', *Antiquity* 42 (1968), 103-08; Heinrich Wagner, 'Der königliche Palast in keltischer Tradition', *Zeitschrift für Celtische Philologie* 33 (1974), 6-14; Hilary Murray, 'Documentary Evidence for Domestic Buildings in Ireland c. 400-1200 in the Light of Archaeology', *Medieval Archaeology* 23 (1979), 81-97, and *Viking and Early Medieval Buildings in Dublin*, British Archaeological Reports, British Series 119 (Oxford 1983), pp. 19-27, 58; Patrick Sims-Williams, 'The Submission of Irish Kings in Fact and Fiction: Henry II, Bendigeidfran, and the Dating of *The Four Branches of the Mabinogi*', *Cambridge Medieval Celtic Studies* 22 (1991), 31-62; R. B. Warner, 'The "Ernean" House', *Emania* 12 (1994), 21-27; J. P. Mallory, 'The Fort of the Ulster Tales', *Emania* 12 (1994), 28-38.

[8]Discussion in *Táin Bó Froích*, ed. Meid, p. 125, n. on l. 51.

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platforms (*airide* < *air-suide* 'sitting in front').[9] In the large halls the social station of guests, like the height from the floor of the compartments and subjacent platforms, seems to have dropped off sharply from the king's seat on the western half of the north wall toward the western end, and more gradually toward the entrance at the eastern end. Finally, along the centre-line of the hall were located lanterns, a hearth with roasting spits, a cauldron with boiled meats, and drinking vat.[10]

As the earlier noted episode with Cú Chulainn suggests, the compartments were employed for both dining and sleeping. Indeed, both activities might go on simultaneously, as in *Togail Bruidne Da Derga*, when the raider Ingcél's malevolent eye makes a circuit of the hostel, stopping at the supine Mac Cécht (misjudging his enormous scale) and the sleeping king Conaire, who is roused thereby to voice a poem of foreboding.[11] In *Serglige Con Chulainn* the convalescent hero's bed seems similarly to have been in a public area and he is joined by others, doubtless seated according to rank or degree of intimacy with the hero:

> Fergus etir 7 fraigid, Conall Cernach etir 7 chrand, Lugaid Réoderg etir 7 adart, Ethne Ingubai fria chossa.

Editor Myles Dillon's glossary would yield the following translation:[12]

> Fergus between him and the wall, Conall Cernach between him and the bed-rail, Lugaid Réoderg between him and the pillow, Ethne Ingubai at his feet.

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[9]See the 'Vocabulary', in *Críth Gablach*, ed. D. A. Binchy, MMIS 11 (Dublin: DIAS, 1941), *s.v.*

[10]The king's hall reproduces on a greater scale the same general organization of interior space as found in more modest dwellings, e.g., farmers' houses or the manor of a tribal king, *Críth Gablach*, par. 46. Despite the spatial correlates given in the various texts, which invite thoughts of rectilinearity, we are doubtless best advised not to think of halls and houses as truly rectangular structures, but rather circular or elliptical.

[11]*Togail Bruidne Da Derga*, ed. Eleanor Knott, MMIS 8 (Dublin: DIAS, 1975), pars 87f., 101.

[12]*Serglige Con Culainn*, ed. Myles Dillon, MMIS 14 (Dublin: DIAS, 1953), ll. 88-90.

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Other references to *crand* in the halls, however, suggests a pillar or post rising toward the roof (like the silver one struck by Conchobar to impose silence). If this were the correct interpretation in this instance, there would have been two vertical reference points (wall and post), and two horizontal (head and foot of the couch).[13]

The dining and sleeping compartments in the hall had another important feature, it, too, closely associated with personal honour, rank and relative location in the hall. The front of the compartments carried a panel or device, *airenech* (possibly composed of *air-* 'before' + *enech* 'face'), indicative of the quality of those within. In a poem from the *Suidigud Tigi Midchuarda* text dealing with the hall at Tara and, more specifically, with the seating order and appropriate cuts of meat served to each of the guests we find: *cach aga, cach airenach / is choir do cach grad* ('each joint [of meat], each front panel that is fitting for each rank').[14] Bricriu's banquet hall in *Fled Bricrend*, modelled on accounts of Tech Midchúarta at Tara, is said to have had *airinig* of bronze thirty feet high and decorated with gold.[15] We cannot know whether a nobleman carried his insignia with him from hall to hall, whether similarly removable devices were owned by the host and hung as required, or whether the compartment façades permanently bore markings suitable for specific grades of guest. Other objects in the hall also served as social markers: the champion's portion over which contention might arise, the quality and provenance of the arms warriors hung on racks behind them, the severed tongues of enemies they carried in their pouches, the balls of

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[13]Cf. *Togail Bruidne Da Derga*, par. 100. *Colba* was used of the horizontal bed-rail or boundary, perhaps more exactly the flat upper surface of the outer side of the bed-frame, wide enough for sitting; see *'The Tragic Death of Cu Roi Mac Dairi'*, ed. and trans. R. I. Best, *Ériu* 2 (1905), 18-35, at pp. 24f., par. 6, the quotation in n. 23 (*infra*) from 'The Boroma', and further examples in *Dictionary of the Irish Language* [= *DIL*], gen. ed. E. G. Quin (Dublin: Royal Irish Academy [= RIA], 1913-76), *s.v. colba*.

[14]*LL*, Vol. 2, pp. 116-20, ll. 3704f. The last words of the second line are completed from the *Yellow Book of Lecan*, cited in George Petrie, 'The History and Antiquities of Tara Hill', *Transactions of the Royal Irish Academy* 18 (1837), 200.

[15]*Fled Bricrend* in *Lebor na hUidre*, eds R. I. Best and Osborn Bergin (Dublin: RIA, 1929), ll. 8051f. The quotation *supra* concerning guests at Cú Chulainn's bedside continues: *a mbátar íarom fón samail sin, tanic fer chucu isa tech, 7 dessid forsind airiniuch na imdai i mboí Cú Chulaind*. He would then have sat in the deferential position on the platform below and before the compartment.

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cranial matter and lime that were on display.[16] Cú Chulainn is seen bringing severed heads attached to his chariot back to Emain Macha after his first initiatory foray against the sons of Nechta Scéne, and other tales have freshly taken heads being shown off in the hall; evidence for permanent display is more reticient.[17]

To return to Conall Cernach and his boast, the absence of any other reference to warriors sleeping in the field or on their return with human trophies prompts the speculatation that the expression *fom glúin* may be related more to ostentation and publicly-managed personal honour than to any sleeping posture thought especially humiliating to the vanquished. Comparative anthropological testimony suggests that head-taking was predicated on the enhancement of honour through the display of material evidence of victory over worthy opponents, rather than on the continuing debasement of a defeated enemy.[18]

Suidigud Tigi Midchúarta (*YBL*), in its programmatic treatment of the layout of the royal hall, states that the students (*scolaighi*) and cup-bearers (*deogbaire*) on the platforms (*airide*) below the compartments (*imdae*) were 'under the knee of the ecclesiastical scholar and king' (*fo glun suad is rig*).[19] Another more archaic text, edited as *Lánellach tigi rích 7 ruirech* by Máirín O Daly, opens as follows:

1. Ar-sesar Conchubar cētath

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[16]For severed tongues, see *Serglige Con Culainn*, par. 2; for brain-balls, *The Death of Conchobar*, in *Death Tales of the Ulster Heroes*, ed. and trans. Kuno Meyer, Todd Lecture Series 14 (Dublin: Hodges Figgis, 1906), pp. 4f., par. 1.

[17]*Táin Bó Cúailnge*, ll. 756ff.; *Fled Bricrend*, l. 9154; '*The Adventures of Nera*', ed. and trans. Kuno Meyer, *Revue Celtique* 10 (1889), 212-28, at pp. 216f., n. to l. 52; *Das Fest Bricriu und die Verbannung der Mac Duil Dermait*, ed. Ernst Windisch, in *Irische Texte*, eds Whitley Stokes and Ernst Windisch, zweite Serie, 1 (Leipzig, 1884), pp. 164-216, par.10 (translation by Kaarina Hollo in 'The Feast of Bricriu and the Exile of the Sons of Dóel Dermait,' *Emania* 10 [1992], 18-24, who has promised a full critical edition of the text). For the rarer example of head-taking in the Fenian tradition, see *Bruiden Átha hÍ* as excerpted by Rolf Baumgarten in 'Placenames, Etymology, and the Structure of *Fianaigécht*,' in *The Heroic Process: Form, Function and Fantasy in Folk Epic*, eds Bo Almqvist, Séamus Ó Catháin and Pádraig Ó Héalaí (Dun Laoghaire: Glendale, 1987), pp. 1-24, at pp. 8f.

[18]Ann Ross, 'The Cult of the Head', in *Pagan Celtic Britain: Studies in Iconography and Tradition* (London: Routledge and Kegan Paul, and New York: Columbia University Press, 1967), pp. 61-126.

[19]Petrie, p. 203.

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2. Ar-sesar Gobne glūn
   .i. suidi goband fo glūn rīg
3. Ar-sesar Forinde fr(a)is
   .i. druid 7 fā[i]th iter di imda
4. Ar-sesar Tot mac Ēogain Horbrecht[o] airiniuch
   .i. cētuth fri rīch dina brethemnib.[20]

She translates:

1. Conchobar sat in the chief seat.
2. Goibne sat by his knee (i.e. the smith's seat is [the smiths' seats are?] below the king's knee).
3. Fordinde sat beside him (i.e. druids and seers between the two compartments).
4. Tot mac Ēogain Orbrecht sat in front (i.e. the judges were beside the king's throne).

I believe these to be archetypically associated, rather than legendary-historically contemporary, figures (although the editor seeks to locate them all among the Ulstermen). My understanding of the seating arrangement is that the two superiors, king and judge, sat in compartments across an open area or hearth from each other. If *airiniuch* (< *airenech*) is taken as a dative functioning as a locative (as O Daly would see *glūn*), and the corrected sequence *fri cētuth rīch* of the gloss is interpreted as 'before the king's seat' rather than 'beside' it, the judge's compartment would have been facing the king's honorific status panel.[21] 'Between the two compartments' were the lower platforms where other chief functionaries, druid and smith, were situated. O Daly also calls attention to Cú Chulainn's place *fo glún Chonchobair* on his return after the Nechta Scéne episode (l 820) and other instances of *fo glún ríg* as the location of the champion's seat.[22]

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[20]*Lánellach tigi rích ocus ruirech*', ed. and trans. Máirín O Daly, *Ériu* 19 (1962), 81-86.
[21]The editor interprets *airiniuch* as 'in the forefront, forward part', but this would normally require a general locus of reference, e.g., the hall.
[22]*Cóir Anmann*, ed. and trans. Whitley Stokes, *Irische Texte* dritte Serie, 2 (Leipzig, 1897), pp. 285-444, No. 249. Ingcél's report on Da Derga's hostel begins with the description of a warrior occuping a prominent position in the hall, who is then identified as Cormac Con

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As well as being situated in real space, the knee is given metaphorical valence as in such instances as the knee raised in the presence of a superior, the fosterling at the knee of his fosterer, the knee as generational unit implying descendants.[23] Other terms in the semantic field of the hall (perhaps including *ordd*) also draw on the imagery of the human body, its parts and stances.

After this examination of a text which appears more archaic than the recensions of the *Scéla Mucce Meic Dathó* preserved in Thurneysen's 'three principal MSS' (iii), a younger rendering of the tale from *LL* is instructive. The comparable portion of text reads:

> 'Toṅgu na toṅgat mo thuath, o ra-gabus gai im láim, nach menic ro-bá cen chend Connachtaig fóm chind oc cotlud, ocus cen guin duine cech oen lá ocus cech oen aidchi.'[24]

The rationalizing approach taken by the *Book of Leinster* toward some traditional matter, as evidenced in its recension of *Táin Bó Cúalgne*, is perhaps illustrated at this point as well. It would appear that an earlier signification of the expression *fo glún* may have been lost, and the weary warrior's head is seen as more needful of support than his knee.

In conclusion, it would be hazardous to attempt to extract trustworthy pre-Christian ethnographical detail from these medieval texts, whatever consonance they may appear to have with classical

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Loinges. As the description of the king and his compartment comes a good number of items later in the text, it may be that this, too, is a reference to the champion's seat on the *airide* below the king's knee (the identity of the incumbent perhaps changing with the circumstances). The text reads: *'cid at-chonnarcaissiu isin fochlu féindida in tigi fri enech rig isind leith anall?'* (ll. 668f.). As both the king and champion are on the north side (*fochla* < *fo clé*) of the hostel, another possibility is that the champion sat face-to-face with the king in his compartment.

[23]Raising the knee: *Críth Gablach*, ll. 605f.; 'The Boroma,' ed. and trans. Whitley Stokes, *Revue Celtique* 12 (1892), pp. 104f., par. 134: *Ocus tóchais [Diarmait] mac Colcon a glún reime [Mo Ling]. Ocus iss and bátar for uaitne cerna in cholbai* (= *LL*, ll. 38,973; 'and Diarmait son of Colmán raised his knee before him. And where they were was on the corner pillar of the bedrail'). Fosterage: Cú Chulainn, *supra*, and *glúndalta* in *DIL*; *glún* as generational metaphor: *ibid.*, *s.v.*

[24]Chadwick, *An Early Irish Reader*, par. 16, n. 2; a portion of this version of the oath, with the relevant phrase, is quoted in Lehmann and Lehmann, p. 115.

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authors' accounts of the continental Celts.[25] But, at a minimum, we can attempt to recover what successive storytellers and scribes may have understood by the perhaps traditional expression *cenn fo glún*. One conclusion would be that in the original conception of this passage of self-description, Conall Cernach, whether at home in Tailtiu or in his tent on forays, did not sleep with severed heads under his knee, but displayed them, among the conventional signs of his rank and prowess, on or by the knee-level panel of his dining and sleeping compartment or their field equivalents. Another conclusion would be to continue the traditional reading of the passage, with the severed heads literally and physically beneath the warrior's knee, but to see this location as dictated by the wider symbolism associated with the knee and by the figurative location of trophies or subordinates *fo glún* in the more elaborate circumstances of the warriors' hall. At a time by which both the practice of taking heads had largely ceased and the interior architectonics of the royal hall may have evolved, the redactor responsible for the relevant text in the *Book of Leinster* or some predecessor interpreted the expression *fo glún* literally but without the larger cultural context and substituted Conall's head for his knee. We, at an even greater remove from this world, have thus far continued the narrow literalist reading.

[25]Texts are conveniently gathered in J. J. Tierney, 'The Celtic Ethnography of Posidonius', *Proceedings of the Royal Irish Academy* 60 C (1960), 189-275.

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Genetics and Spearman's 'g' Factor

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Philip A. Vernon (ed.). *Biological Approaches To The Study Of Human Intelligence.* Ablex Publishing Corporation, 1993. 416 pp.
John B. Carroll. *Human Cognitive Abilities: A Survey Of Factor Analytic Studies.* Cambridge University Press, 1994. 810 pp.

> The empirical sciences are systems of theories. The logic of scientific knowledge can therefore be described as a theory of theories ... Theories are nets cast to catch what we call 'the world': to rationalize, to explain, and to master it. We endeavor to make the mesh ever finer and finer. Karl R. Popper, *The Logic of Scientific Discovery*, 1959: 59.

A "psycho-fact" is what *Newsweek* columnist Robert Samuelson refers to as a widely accepted irrational belief. "We are hounded by what I call 'psycho-facts': beliefs that, though not supported by hard evidence, are taken as real because their constant repetition changes the way we experience life," he argues.

While Samuelson's point is sound, questions remain over the origins of psycho-facts and the nature of what he calls their "constant repetition". Since the public relies on the mass media for information, one explanation for their prevalence is that they are the result of skewed information. Ironically, some of the culprits responsible for allowing psycho-facts to influence public opinion are from Samuelson's own profession. Consider the news coverage of IQ research.

The media's endless depiction of intelligence as the 'IQ controversy' shows that psycho-facts are a staple of IQ-related news accounts. A recent example is Sarah Glazer's 1994 feature article from *The Washington Post*, 'The IQ Controversy: Is Intelligence Inherited? How Is It Measured?' Her assessment of IQ matters, especially the nature/nurture issue, disregards a consensus of expert opinion. Glazer's account bolsters the Snyderman and Rothman

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findings, confirming that ideological factors sway the coverage of the IQ controversy. Moreover, they point out that this pattern of biased reporting reflects the egalitarian nature of the media's ideological tilt.

Social ideology may not fully explain the contrast between the press and the scientific community on IQ research; nonetheless the dissimilarities are striking. Nothing illustrates this discord better than Glazer's feature article and the recent findings from two major works on intelligence.

Glazer begins with the story of a teacher who is convinced that the reading difficulties her five children experience is "an inherited disorder". Using this incident as an example of how genetics has changed our understanding of learning disabilities, she oversimplifies the issue as one of *either* 'nature' or 'nurture'. Patricia O'Connell Ross, a Department of Education director, claims (erroneously) that "children from different cultural and ethnic groups are not given fair measure by the tests". Glazer: "IQ tests are increasingly criticized by educators, parents, and some interest groups as being biased toward a white, middle-class norm ...". Neither the thorough scrutiny that tests undergo for items of bias nor the findings of a National Research Council panel of experts, who rejected the claim that IQ tests are culturally biased, received any mention.

Glazer mentions the research of Robert Plomin and Thomas Bouchard primarily to advance the views of adversaries of behavior genetics. By merely echoing this shallow criticism, she fails to weigh the *quality* of Bouchard and Plomin's work against the claims of their critics. Finding a credentialed critic on most subjects requires little effort. However, the merits of a critique should meet what Robert Nozick calls the first rule in accepting the validity of any claim: "Do not believe *h* if some alternative statement incompatible with *h* has a higher credibility value than *h* does" (1993: 85). Published accounts notwithstanding, behavior geneticists have answered their critics and still await replies. For instance, Glazer quotes Harvard geneticist and critic Jon Beckwith without acknowledging Bouchard's rebuttal to Beckwith in *Science* (1991). As Bouchard asserts, "*Ad hoc* criticism of individual studies (pseudoanalysis) is no longer a viable strategy" (1993).

And saving the day, of course, is Howard Gardner's theory of "multiple intelligences", which now enables us to appreciate the various 'flavors' of intelligence. (Glazer devotes a separate piece to Gardner's work.) Implicit in this reasoning is that Gardner's theory

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nullifies the polygenic basis of intelligence. Since the polygenic theory is associated with psychometrics and given that Gardner challenges traditional methods of IQ testing, nurturists view his work as a novel alternative to the genetic hypothesis. In short, his theory is perceived as embracing nurture and rejecting nature. However, in *Frames of Mind* Gardner emphasizes the importance of understanding the biological basis of intelligence:

> In my view, the evidence points to the following conclusions. There is considerable plasticity and flexibility in human growth, especially during the early months of life. Still, even that plasticity is modulated by strong genetic constraints which operate from the beginning and which guide development along some paths rather than others. As for the issue of identity, evidence is accumulating that human beings are predisposed to carry out certain specific intellectual operations whose nature can be inferred from careful observation and experimentation. Educational efforts must build upon a knowledge of these intellectual proclivities and their points of maximum flexibility and adaptability (1983).

Egalitarians have embraced Gardner's view largely because it redefines genius as a uniqueness based upon *diversities* of talent rather than *qualities* of talent. As a Montgomery County, Maryland, educator explains in Glazer's piece, "The goal for teachers becomes not 'Who is gifted?' but 'How is each child gifted?'" Broadening giftedness to include a range of diverse talents that otherwise would not be considered exceptional clearly appeals to egalitarians. Suppose one's child is gifted in more than one area. In addition to being musically talented, he also excels in reading, language and mathematics. Does this suggest that talents differ in kind or degree? In other words, are there degrees of *qualitative differences* that distinguish average or 'diverse' talent from the gifted? Furthermore, is the pool of exceptional talent evenly distributed throughout society? And what about the presence of an underlying factor – a general factor or Spearman's 'g' – that may be a major source of these differences?

The paradox of Gardner's view is his recognition of what egalitarians have been reluctant to acknowledge all along: the innateness of individual differences. Gardner now advocates that curriculum and teaching methods should address individual differences in cognitive ability. Unfortunately, Glazer barely delves

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beyond surface issues that are out of sync with contemporary research findings. Researchers are now identifying genetic influences for specific cognitive abilities that differ from genetic influences on general cognitive ability. To question whether intelligence is inherited is like questioning whether oxygen and hydrogen are molecular elements of water.

This sort of news coverage raises two points. First, blindly accepting the claims of nurturists merely to counter the findings of behavior genetics is untenable. Since journalists rarely probe the long-term failures of programs like Head Start, the assumptions of early interventionists are seldom challenged. If the case against the polygenic theory of intelligence rests upon the premise that only more early intervention programs stand in the way of boosting IQs, then the burden of proof falls upon those who insist that such measures will notably raise IQ levels. As a result of the program's poor long-term gains, the objectives of Head Start advocates continue to fluctuate and their goals remain elusive. By ignoring the work of differential psychologists and behavior geneticists, early intervention advocates are unable to square the IQ circle. Eventually the underlying reasons for this futile track record, which Herman Spitz has documented so well, has to be explained (1986).

Second, like most news accounts of IQ research, neglected aspects of IQ studies contradict the assumptions conveyed by the mass media. Accurate details on the historical development of IQ testing are sketchy at best. Likewise, the field of behavior genetics remains unknown to the average layperson. Although it's unreasonable to expect everyone to grasp the intricacies of multivariate analysis, journalists have some culpability for shoddy scientific reporting. The extent of most people's knowledge on these matters is what appears in the newspaper or on television. Unfortunately, it's only the tip of the information iceberg. The efforts of many diligent researchers, those who have paid a high price for swimming against politically correct currents, are routinely ignored by the press. Little if any appreciation is accorded scholars who have devoted their professional careers to the investigation of cognitive abilities.

As Harvard psychologist Richard Herrnstein has shown, news reports of IQ results typically reject the validity of IQ tests (1982). If psycho-facts and social ideology do not account for the widening gap between science and the mass media over IQ research, then what does? Something has to explain why the empirical findings of the

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former remain at odds with the reported information of the later. While the popular press dwells upon the issues of yesterday, scholars are breaking new ground with the use of advanced behavior genetic analysis. The fact that a major U.S. newspaper would focus upon current trends in IQ studies without mentioning major research findings shows at best a superficial level of interest.* The results of two pioneering volumes tell a different tale, one that clashes with the 'psycho-fact' version of the fourth estate.

The contributions in Philip A. Vernon's *Biological Approaches to the Study of Human Intelligence* firmly establish the relevance of investigating biological factors. The evidence for a biological basis, particularly the influence of genetics, has been mounting for more than a decade. The contributors explain what this research, based in part on new, elaborate methods, tells us about the biology of mental ability.

In his introductory chapter, Eysenck establishes the conceptual framework for the rest of the text. Several solid points are made in this theoretical overview. The implications of the testing data that were once limited to western nations have now been confirmed on an international scale. Contrary to Marxian analysis, IQs are not a construct of capitalist societies. Individual differences persist in free market systems as well as in socialist and communist regimes. Furthermore, individual and group differences in IQ remain despite extreme social engineering of some nations. Simply put, 'level playing fields' have failed to distribute IQs evenly.

Perhaps the most important theme in Eysenck's chapter is the folly of extreme environmentalism. Those who continually assert that the lack of educational training accounts for individual and group differences in IQs have a great deal to explain when one considers other correlates of IQ measurements. The rival explanations for

*Another way of contrasting the coverage between the popular press and the scientific community on behavior genetic research is to compare Glazer's treatment of the subject with a special issue of *Science*, which featured recent trends within the field (1994). Given how differently behavior genetic research is portrayed in these accounts, it's ironic that the "Genes and Behavior" issue of *Science* appeared ten days after Glazer's piece in *The Washington Post*. Although the *Science* coverage focused more on the broader domain of personality traits (including intelligence), the nature of the reporting differed considerably from Glazer's article. Hence, the scant picture that the mass media regularly paint of this influential field is one that is intentionally negative. After reading each account, one would clearly reach different conclusions on the advancements that behavior geneticists have made in recent years.

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these differences, 'speed of information processing, the integrity of [neural] circuity' and 'the bio-chemistry of g', as Eysenck summarizes them, challenge the prevailing causal assumptions about IQ deficits. Of course there are ways around this; simply discredit the validity of IQ tests or claim that this level of analysis is skewed or even argue that 'true' reform measures (curriculum & teaching methods) wait to be implemented. To paraphrase the late William McDougall, these are merely red herrings drawn across the track to put us off the scent (1921: 52).

In reviewing the evidence for "the genetic architecture of human intelligence," Bouchard analyzes the results from twin and adoption studies in the context of a hierarchy of mental ability traits. There is little doubt in Bouchard's belief that behavior genetics has resolved the preliminary issues over heredity and environment. He closes on this forward looking note:

> The evidence regarding genetic influence on intelligence, when viewed as a whole, overwhelmingly supports the conclusion that genetic factors are the single most important source of variation. Genes are the distal causes of a great deal of variation in IQ. The research front has now moved well beyond this question. The focus of attention is now on questions such as: What kind of gene action is at work? How do genes drive developmental process? What type of genotype X environment interactions are important in the development of intelligence? How and to what extent do genotypes create environments? What is the role of assortative mating? Most of these questions address proximal questions of how nature and nurture work together in the development of a phenotype – *nature via nurture as opposed to nature versus nurture.*

The genetic influence on ability development during early childhood is the focus of Lee Anne Thompson's paper. The results of family, adoption and twin studies show that the shared and non-shared family environment play influential roles in early developmental stages. Genetic influences remain stable throughout the adult lifespan while the first year of infancy is optimal for the influence of non-genetic factors. Data from longitudinal adoption and twin studies are yielding more clues about how the genetic-environment interaction produces phenotypic behavior.

Scholars have always been intrigued over the relationship between physical and mental traits. Jensen and Sinha reconsider the

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correlational evidence as well as the assumptions that lie behind the prevailing acceptance of the null hypothesis – the idea that physical and mental traits are not causally connected. They believe that there is more to this unresolved mystery than what researchers have been able to determine. Beginning with a brief review of Donald G. Paterson's *Physique and Intellect*, Jensen and Sinha examine a wide array of findings and show how advanced statistical methods of meta-analysis can shed new light on causal factors.

Although several previous studies eventually led researchers to believe that correlations between physical and mental traits were not causally related, more recent and thorough analyses show that stature, brain-size, myopia, and to some degree blood groups show consistent correlational patterns. Jensen and Sinha believe that investigators in the past have accepted the null hypothesis in order to avoid a type II statistical error, and as a result scholars have thrown out the baby with the bath-water. After surveying the evidence, Jensen and Sinha conclude that:

> The massive evidence of significant correlations between scores on psychometric tests of mental ability and a wide variety of physical traits shows beyond a reasonable doubt that the population variance on standard mental tests reflects latent traits that are profoundly enmeshed with organismic variables in complex ways.

One promising area of research is the role of nutrition in mental development. Lynn's brief chapter explores the link between nutrient deficiency, brain size and intelligence. His argument is that intellectual maturation depends upon normal brain growth which in turn is affected by nutritional intake in the early stages of fetal development. The lack of sufficient nutrients during the prenatal period and early infancy may lead to mental abnormalities. By the same token, vitamin supplements seem to show some modest gains in raising IQs.

Four remaining chapters explore the use of sophisticated technologies that are shedding new light on the biological structure of mental processes and its relationship to human intelligence. The contributors cover the results of monitoring brain activity, specifically Average Evoked Potentials (AEP) and EEG measures, as correlates of intelligence. The evidence for bio-chemical, neural and hormonal influences as well as cerebral glucose metabolism is examined in considerable detail.

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Some critics may complain about a lack of balance in the pages of this text. This is perhaps a typical response from the editor of any sizable general interest journal. Even so, one should consider the scores of volumes and subsequent reviews that regularly appear with little if any discussion about the biological realm of intelligence. Now that this research collection finally brings some 'balance' to the field of IQ studies, one wonders if any general interest publication will consider reviewing this important volume.

The nature of human intelligence and its significance to human endeavors is *the* distinguishing characteristic of the human species. One of the most successful undertakings attributed to modern psychology is the measurement of mental abilities. Though rarely appreciated outside academe, the breakthrough in objectively gauging the nature and range of mental abilities is a pivotal development in the behavioral sciences. While this accomplishment has far-reaching implications for many areas of society, the full meaning of the test data has lacked a comprehensive theory that accounts for several major developments over the years. The track of data left by researchers remains diffuse without a clear signpost in the broad landscape of mental abilities.

John Carroll's *Human Cognitive Abilities: A Survey of Factor Analytic Studies* fills this much needed void. The former director of the L. L. Thurstone Psychometric Laboratory brings together 60 years of factor analytic research in what is arguably the most comprehensive theoretical blueprint to date. Carroll's "three-stratum theory" of cognitive abilities is based upon his own re-analysis of 477 data sets that span the period from the pioneering work of Charles Spearman to the present.

This meticulous study leaves few stones unturned in its comprehensive review of cognitive abilities. Just how meticulous Carroll's treatment is of the subject is indicated in the first part of the survey. The full bibliography lists ten thousand items. From this 1500 were selected as "pertaining to the correlational or factor analysis of cognitive abilities ...". Carroll then created a computerized file for recording and analyzing each original data set. Finally, 477 of the most detailed data sets were selected for this study. To say that the author's re-analysis and theory are impressive is an understatement.

The text is variously historical, analytical and theoretical. Carroll spends the first chapter clarifying terms, specifically the concept of

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"ability". He defines ability in terms of "an attribute of individuals" that:

> refers to the possible variations over individuals in the limited levels of task difficulty (or in derived measurements based on such limited levels) at which, on any given occasion in which all conditions appear favorable, individuals perform successfully on a defined class of tasks.

From his treatment in defining concepts to the methodical procedure in reworking data sets, the outstanding feature of Carroll's work is his careful approach to the various areas that few have mastered so well. Without a doubt, the present study is the definitive survey of factor analytic models to date.

The three-stratum theory closely resembles the hierarchial models of intelligence proposed by Spearman, Holzinger, Thurstone, P. E. Vernon, Horn, and Cattell's "triadic theory". The structure of this particular model is in three tiers: general, broad and narrow. The third stratum, general cognitive ability or Spearman's 'g', branches into a second stratum of eight broad abilities. From each of these broad abilities flows numerous level and speed factors that are unique to individual stratum two abilities. These narrow abilities make up the first stratum. Most of the volume (eleven chapters) is devoted to identifying and describing the broader 'domains' of cognitive abilities, e.g., language, cognitive speed, reasoning, visual perception, psychomotor abilities and so on.

Carroll draws a parallel between physical strength and cognitive ability. Both vary among individuals and the degree of variance fluctuates over time. For example, the strength of a child is unlike that of a young adult which differs from that of an elderly person. By the same token, there is a developmental range throughout the lifecycle which allows us to recognize a child who is either physically strong or weak relative to other children in that stage of development. The same essentially applies to mental abilities.

Although the book's major point is that intelligence or cognitive ability is essentially a hybrid combination of general mental ability (Spearman's 'g') and specialized abilities, the importance of a general factor in the structure of human abilities is one that can not be taken too lightly. The evidence as Carroll points out is overwhelming. In light of the present survey, what really hits home is how well Spearman's theory has held up over time. In addition to recognizing

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the importance of 'g', the three-stratum theory encompasses the Crystallized ('Gc') and Fluid ('Gf') Intelligences that Cattell discovered in 1963. Although the three-stratum theory recognizes as many as thirty specialized abilities, Carroll's assessment of Gardner's theory of multiple intelligences is bleak at best.

The author elaborates upon the societal implications of his research in the final chapter. The one issue on which Carroll is adamant is that, contrary to the clamor of critics, the track record of factor analysis provides a sound assessment for understanding the nature of cognitive abilities. As Carroll notes:

> The theory does, however, give the lie to allegations that science has not yet offered a satisfactory definition of intelligence, a theory of intelligence, or a body of sound knowledge about cognitive abilities.

One final observation that Carroll makes is the importance of recognizing that individuals differ with respect to cognitive abilities. While Carroll attributes these differences to both learning experiences and genetic influences, he acknowledges that the development of cognitive abilities should lay to rest the often repeated claim that "all human beings are created equal".

The contrasts between the findings of the scientific community and the 'news' reports on IQ research should at least be self-evident by now. The point was made earlier that part of the explanation resides in the ideological slant of journalists and their reluctance to acknowledge without ideological preconceptions the scientific record. Karl Popper put his finger on what distinguishes the scientific method from the approach of journalists. In *Conjectures and Refutations*, Popper notes that the journalistic method of relying upon sources inadequately establishes the truth of any theory or hypothesis. As Popper states:

> The fundamental mistake made by the philosophical theory of the ultimate sources of our knowledge is that it does not distinguish between questions of origin and questions of validity. Admittedly, in the case of historiography, these two questions may sometimes coincide. The question of the validity of an historical assertion may be testable only, or mainly, in the light of the origin of certain sources. But in general the two questions are different; and in general we do not test the validity of an assertion or information

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> by tracing its sources or its origins, but we test it, much more directly, by a critical examination of what has been asserted – of the asserted facts themselves (1963: 24f.).

The problem here isn't so much the use of sources *per se*, since this approach is critical for the work of journalists, but rather an over-reliance upon sources in nearly every instance. As the two volumes above illustrate, the method of testing and retesting (replicating) scientific findings is far superior to simply relying upon sources. The failure to acknowledge a consensus or new scientific paradigm is but one result from a blind use of sources in which virtually any critic's comments will suffice as an opposing view. This in turn leads to a false dichotomy, like that which reappears time and again as the 'IQ controversy'. As long as the lethal combination of 'sources' and social ideology continue to filter the news on IQ research, the public can count on getting massive doses of psycho-facts rather than solid scientific findings.

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